



**FCC CFR47 PART 15 SUBPART C**

**CERTIFICATION TEST REPORT**

**FOR**

**CELLULAR/PCS CDMA AND LTE PHONE WITH BLUETOOTH AND WLAN**

**MODEL NUMBER: LS840, LG-LS840, LGLS840\***

**FCC ID: ZNFLS840**

**REPORT NUMBER: 11U14124-2**

**ISSUE DATE: NOVEMBER 21, 2011**

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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>
--	11/21/11	Initial Issue	

## TABLE OF CONTENTS

<b>1. ATTESTATION OF TEST RESULTS</b>	<b>5</b>
<b>2. TEST METHODOLOGY</b>	<b>6</b>
<b>3. FACILITIES AND ACCREDITATION</b>	<b>6</b>
<b>4. CALIBRATION AND UNCERTAINTY</b>	<b>6</b>
4.1. MEASURING INSTRUMENT CALIBRATION	6
4.2. SAMPLE CALCULATION	6
4.3. MEASUREMENT UNCERTAINTY	6
<b>5. EQUIPMENT UNDER TEST</b>	<b>7</b>
5.1. DESCRIPTION OF EUT	7
5.2. MAXIMUM OUTPUT POWER	7
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	7
5.4. SOFTWARE AND FIRMWARE	7
5.5. WORST-CASE CONFIGURATION AND MODE	7
5.6. DESCRIPTION OF TEST SETUP	8
<b>6. TEST AND MEASUREMENT EQUIPMENT</b>	<b>10</b>
<b>7. ANTENNA PORT TEST RESULTS</b>	<b>11</b>
7.1. BASIC DATA RATE GFSK MODULATION	11
7.1.1. 20 dB BANDWIDTH	11
7.1.2. HOPPING FREQUENCY SEPARATION	15
7.1.3. NUMBER OF HOPPING CHANNELS	17
7.1.4. AVERAGE TIME OF OCCUPANCY	22
7.1.5. OUTPUT POWER	29
7.1.6. AVERAGE POWER	33
7.1.7. CONDUCTED SPURIOUS EMISSIONS	34
7.2. ENHANCED DATA RATE 8PSK MODULATION	43
7.2.1. 20 dB BANDWIDTH	43
7.2.2. HOPPING FREQUENCY SEPARATION	47
7.2.3. NUMBER OF HOPPING CHANNELS	49
7.2.4. AVERAGE TIME OF OCCUPANCY	54
7.2.5. OUTPUT POWER	61
7.2.6. AVERAGE POWER	65
7.2.7. CONDUCTED SPURIOUS EMISSIONS	66
<b>8. RADIATED TEST RESULTS</b>	<b>75</b>
8.1. LIMITS AND PROCEDURE	75
8.2. TRANSMITTER ABOVE 1 GHz	76
8.2.1. BASIC DATA RATE GFSK MODULATION	76
8.2.1. ENHANCED DATA RATE 8PSK MODULATION	85

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8.3. *WORST-CASE BELOW 1 GHz* ..... 94

9. **AC POWER LINE CONDUCTED EMISSIONS** ..... 97

10. **MAXIMUM PERMISSIBLE EXPOSURE** ..... 101

11. **SETUP PHOTOS** ..... 105

# 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 CDMA and LTE Phone with Bluetooth and WLAN

**MODEL:** LS840, LG-LS840, LGLS840

**SERIAL NUMBER:** 74000549, 74000556

**DATE TESTED:** OCTOBER 31, NOVEMBER 1-2, 2011

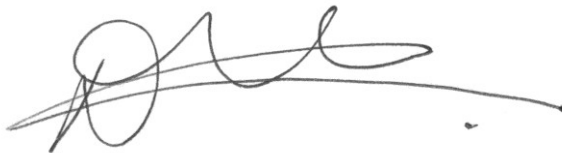
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass

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.

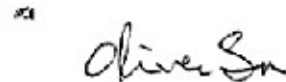
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of 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:

Tested By:



DAVE WEAVER  
EMC SUPERVISOR  
UL CCS



OLIVER SU  
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, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

## 3. FACILITIES AND ACCREDITATION

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

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

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

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

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

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

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a smart-phone that features Cellular/PCS CDMA and 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)
2402 - 2480	Basic GFSK	10.73	11.83
2402 - 2480	Enhanced 8PSK	9.72	9.38

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio uses a Direct Printed Antenna, with a maximum peak gain of -1.69 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The software installed in the EUT during testing was V07D\_June 23, 2011.

The test utility software used during testing was Bluetooth FCC.

### 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

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

For the fundamental investigation, since the EUT is a portable device that has three orientations; X, Y and Z orientations have been investigated, also with AC/DC adapter, and earphone, and the worst case was found to be at X orientation with AC/USB adapter and earphone.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	LG Electronics	MCS-02WS	SA14258000036	N/A
Ear Phone	LG Electronics	N/A	N/A	N/A

### I/O CABLES

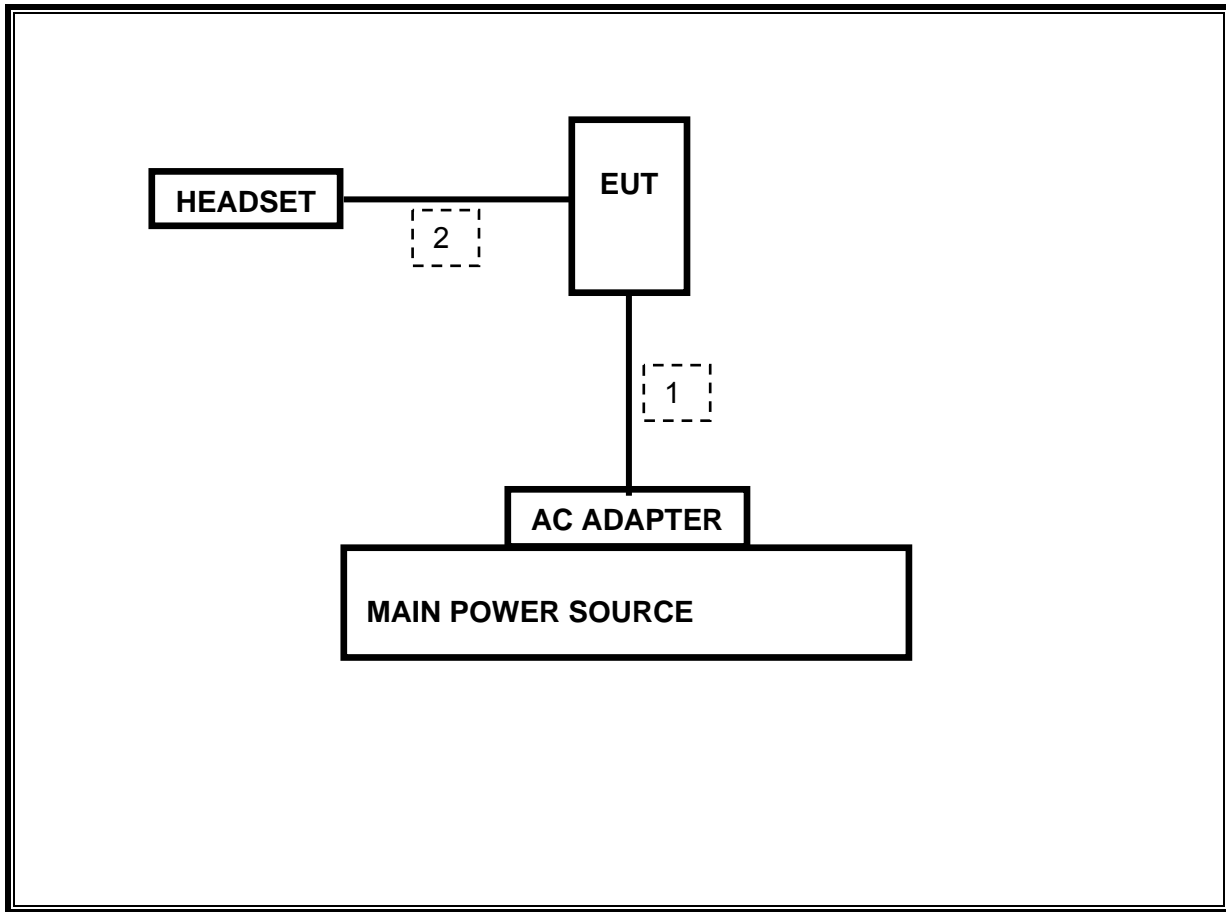
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	Mini Jack	Un-Shielded	1.0m	External ferrite added
2	Audio	1	Mini Jack	Un-Shielded	1.0m	Volume control on cable

### TEST SETUP

The EUT is a stand-alone device and was tested with AC/USB adapter and earphone. Bluetooth Tester was used to control the EUT.



**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, 26.5 GHz	Agilent / HP	E4440A	C01176	08/15/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	07/08/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	01/27/12
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06/30/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/16/12
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	08/11/12
P-Seies single channel Power	Agilent / HP	N1911A	N/A	08/04/12
Peak / Average Power Sensor	Agilent / HP	E9323A	N/A	08/04/12
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	07/06/12
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11
Bluetooth Tester	R & S	1153.9000K35	N/A	04/22/12

## 7. ANTENNA PORT TEST RESULTS

### 7.1. BASIC DATA RATE GFSK MODULATION

#### 7.1.1. 20 dB BANDWIDTH

##### LIMIT

None; for reporting purposes only.

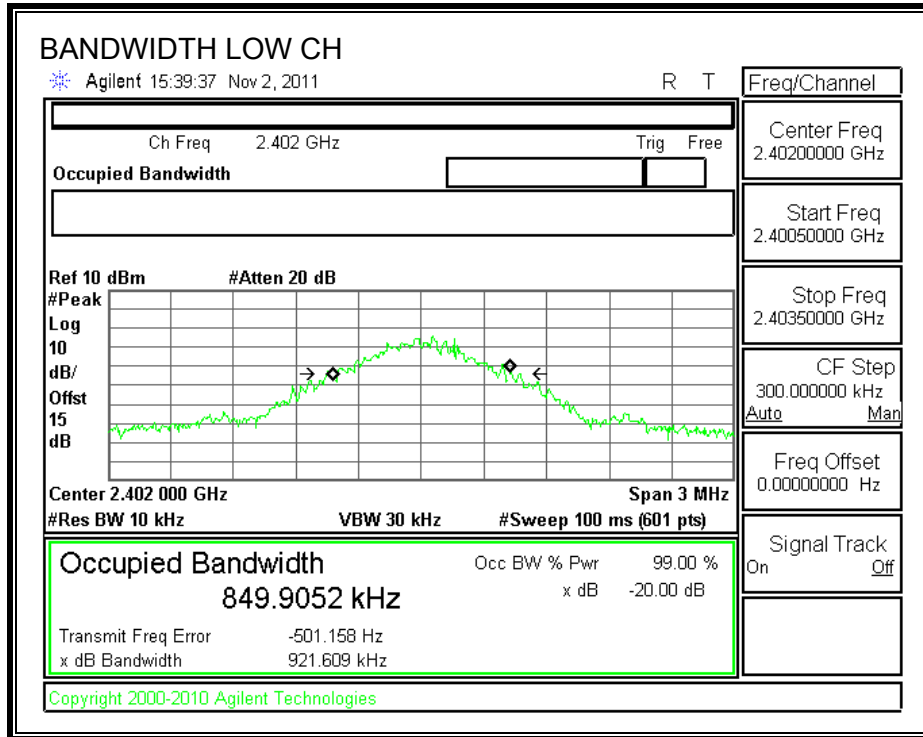
##### TEST PROCEDURE

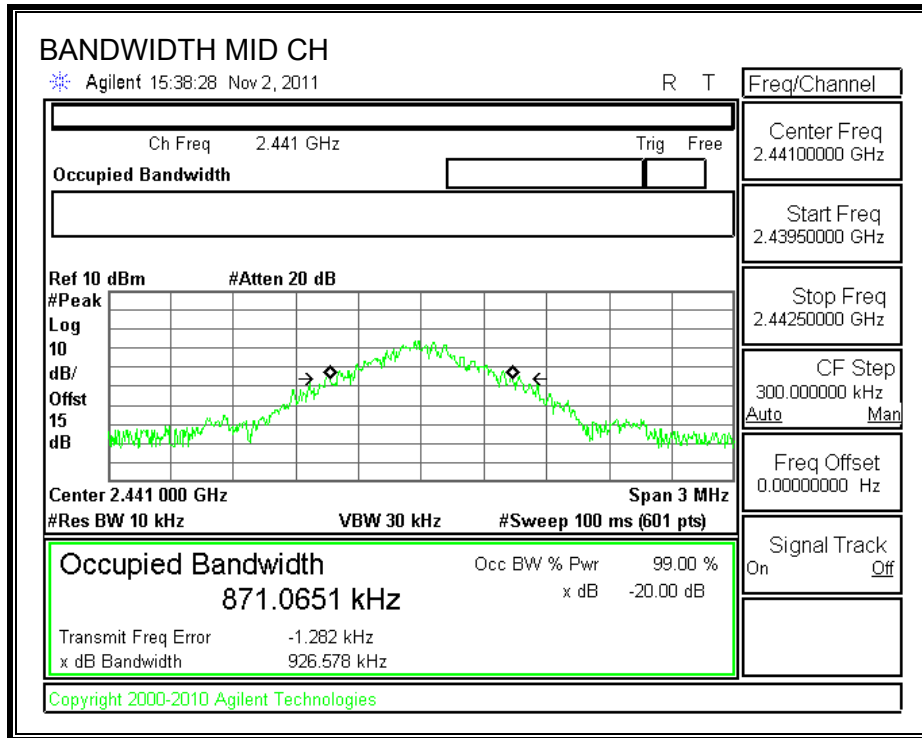
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

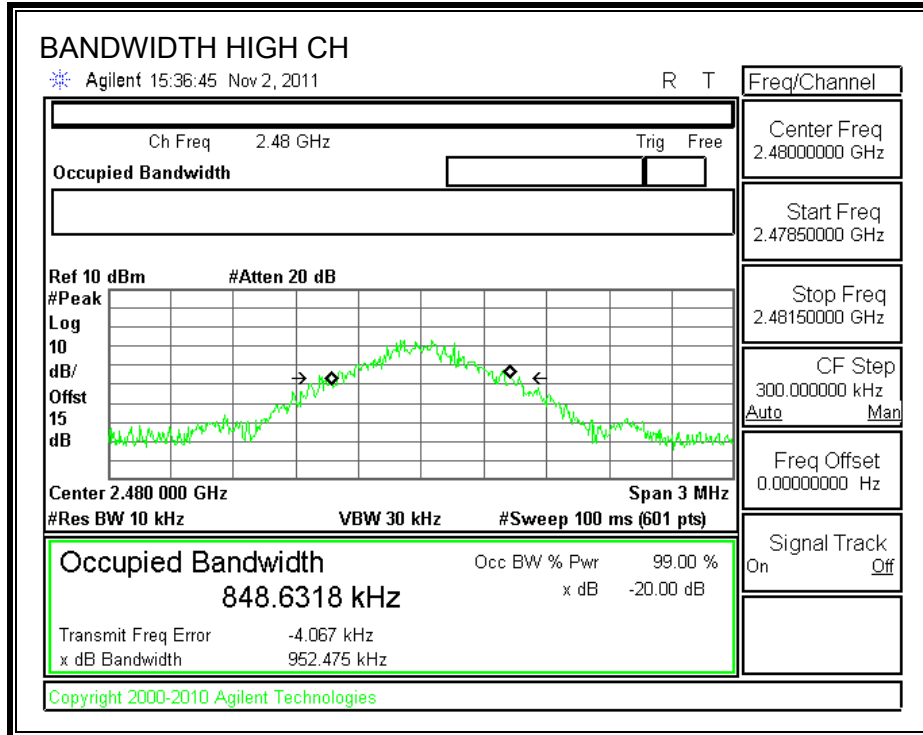
##### RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	921.609
Middle	2441	926.578
High	2480	952.475

**20 dB BANDWIDTH**







## 7.1.2. HOPPING FREQUENCY SEPARATION

### LIMIT

FCC §15.247 (a) (1)

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

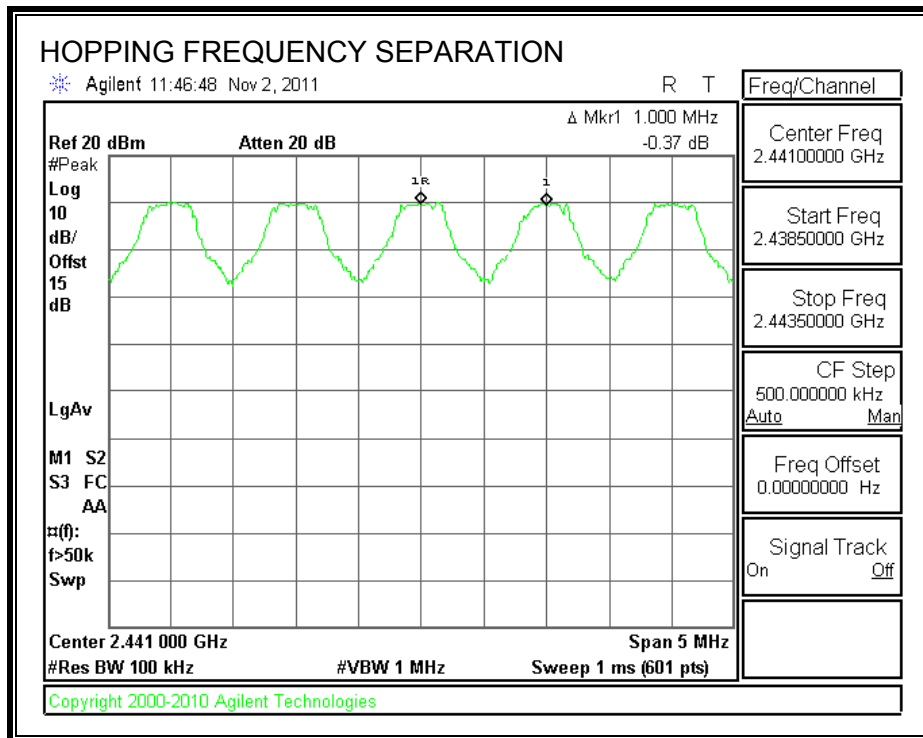
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 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 1 MHz. The sweep time is coupled.

### RESULTS

**HOPPING FREQUENCY SEPARATION**





### **7.1.3. NUMBER OF HOPPING CHANNELS**

#### **LIMIT**

FCC §15.247 (a) (1) (iii)

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

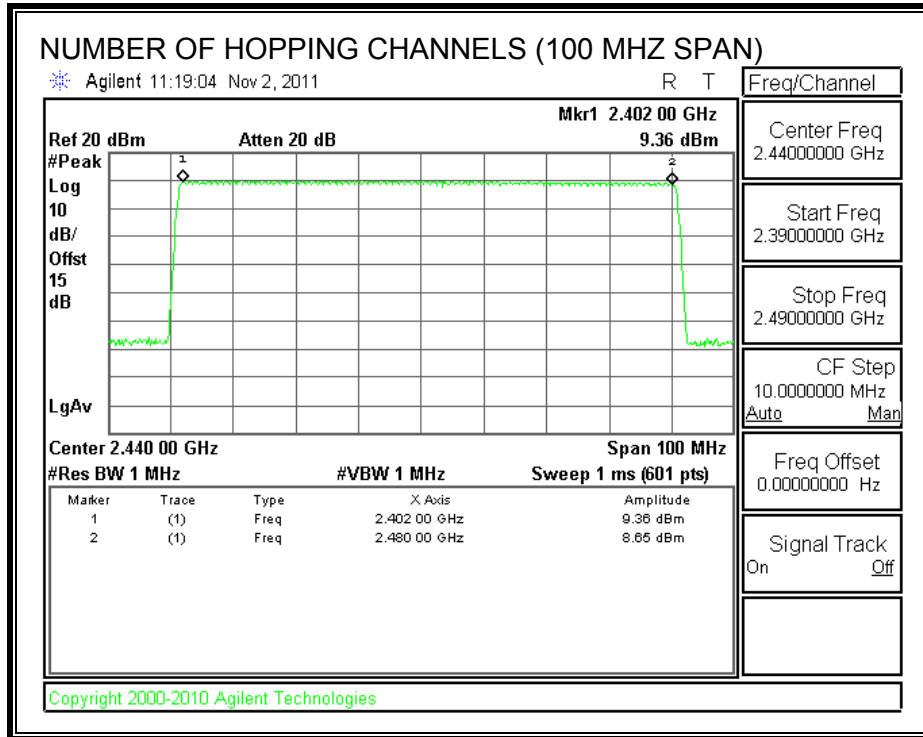
#### **TEST PROCEDURE**

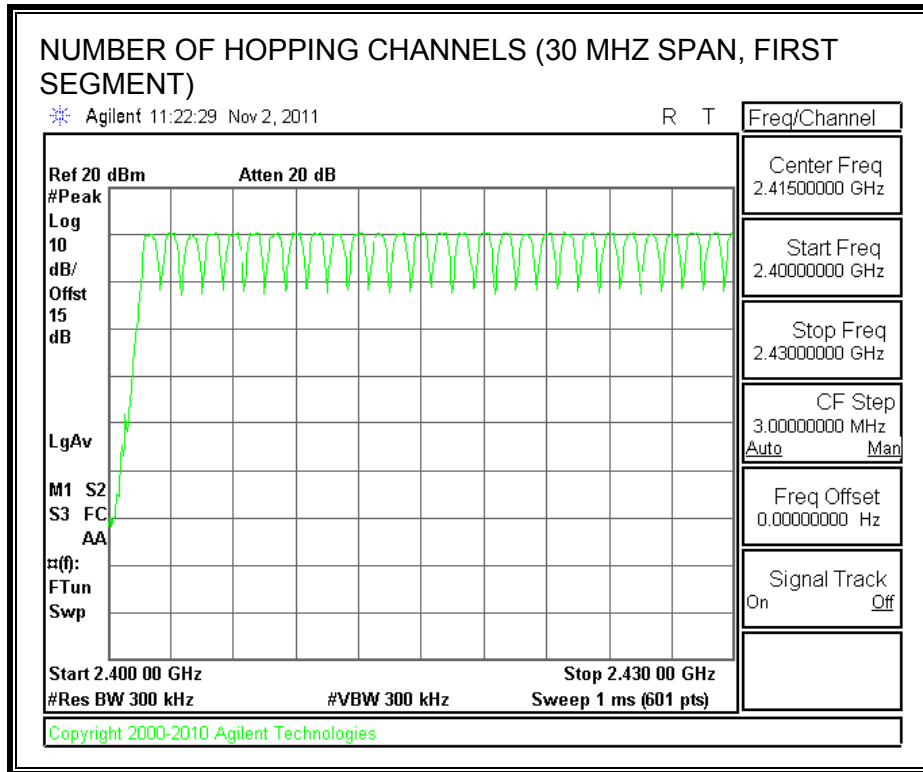
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

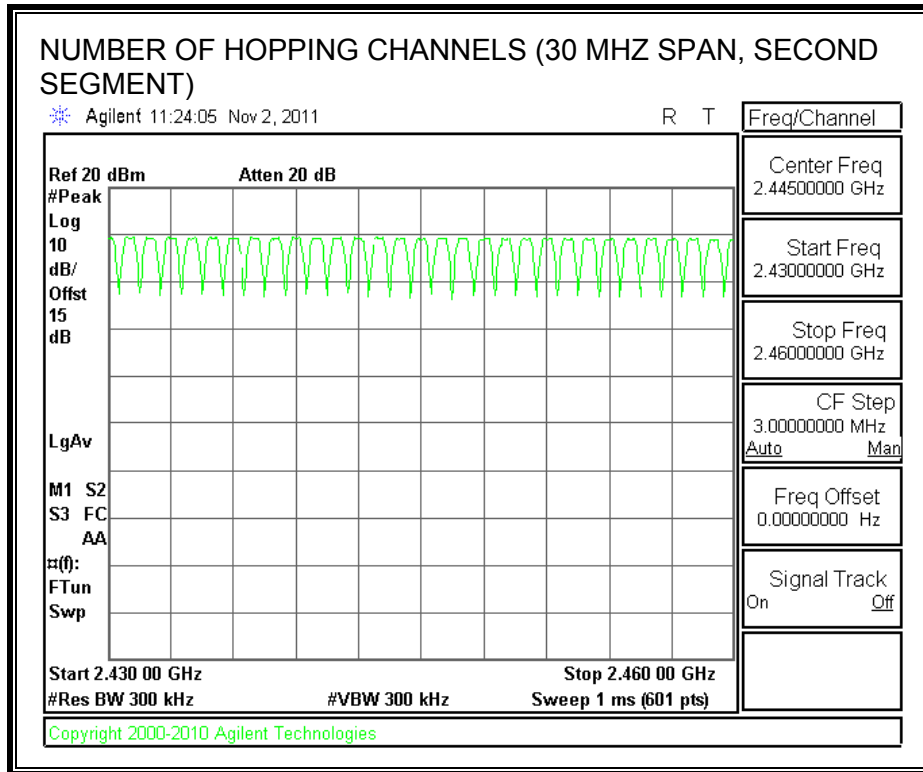
#### **RESULTS**

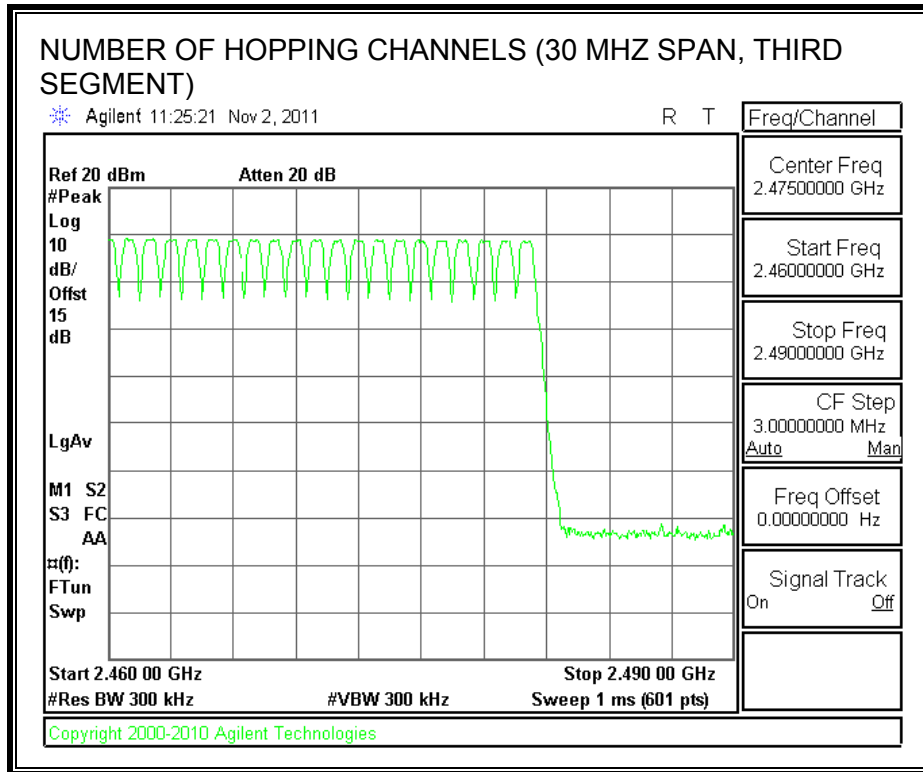
79 Channels observed.

**NUMBER OF HOPPING CHANNELS**









### 7.1.4. AVERAGE TIME OF OCCUPANCY

#### LIMIT

FCC §15.247 (a) (1) (iii)

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  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$ .

#### RESULTS

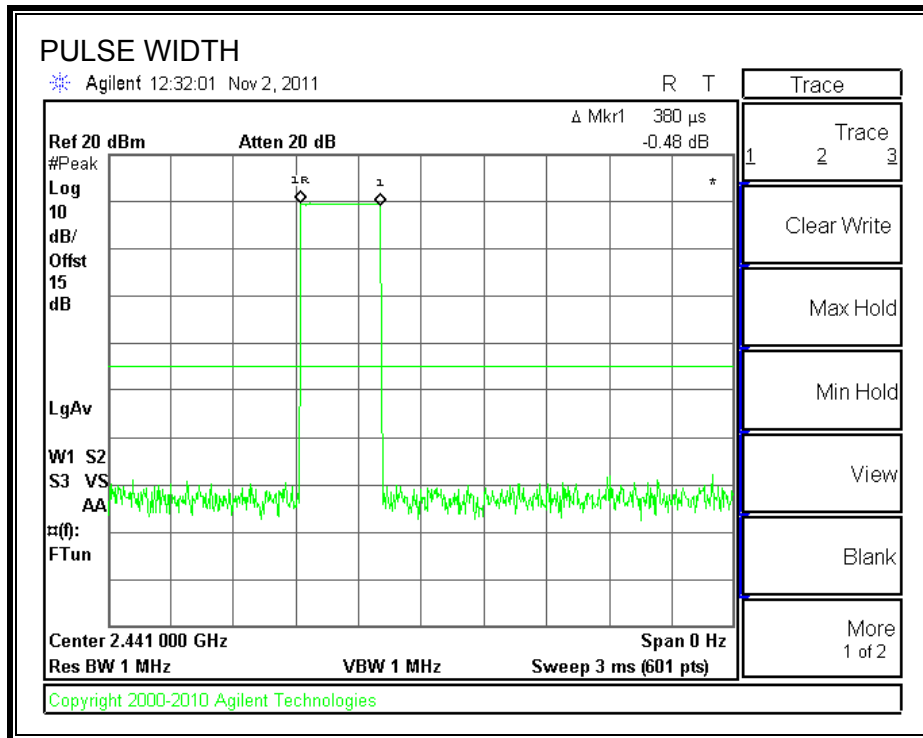
Time of Occupancy =  $10 * xx \text{ pulses} * yy \text{ msec} = zz \text{ msec}$

#### GFSK Mode

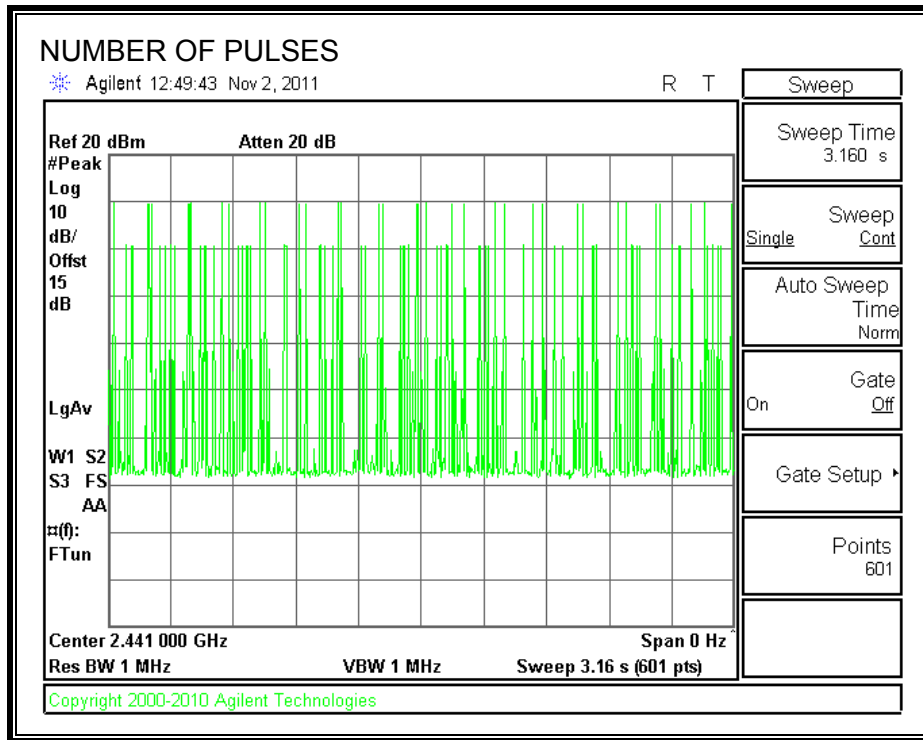
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.38	31	0.118	0.4	-0.282
DH3	1.635	16	0.262	0.4	-0.138
DH5	2.891	10	0.289	0.4	-0.111

**DH1**

**PULSE WIDTH**



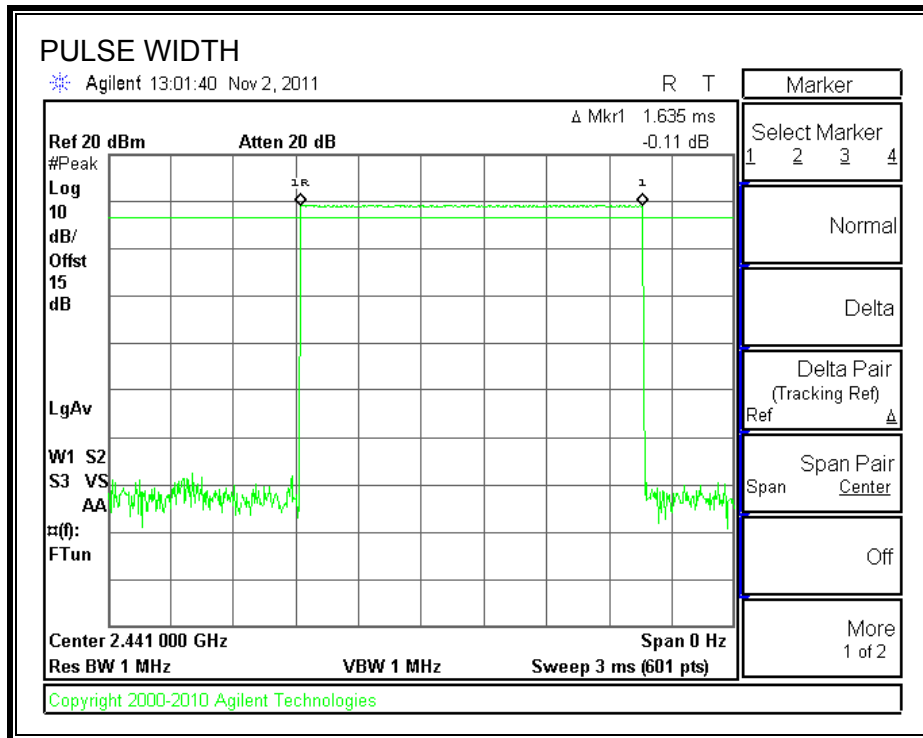
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**



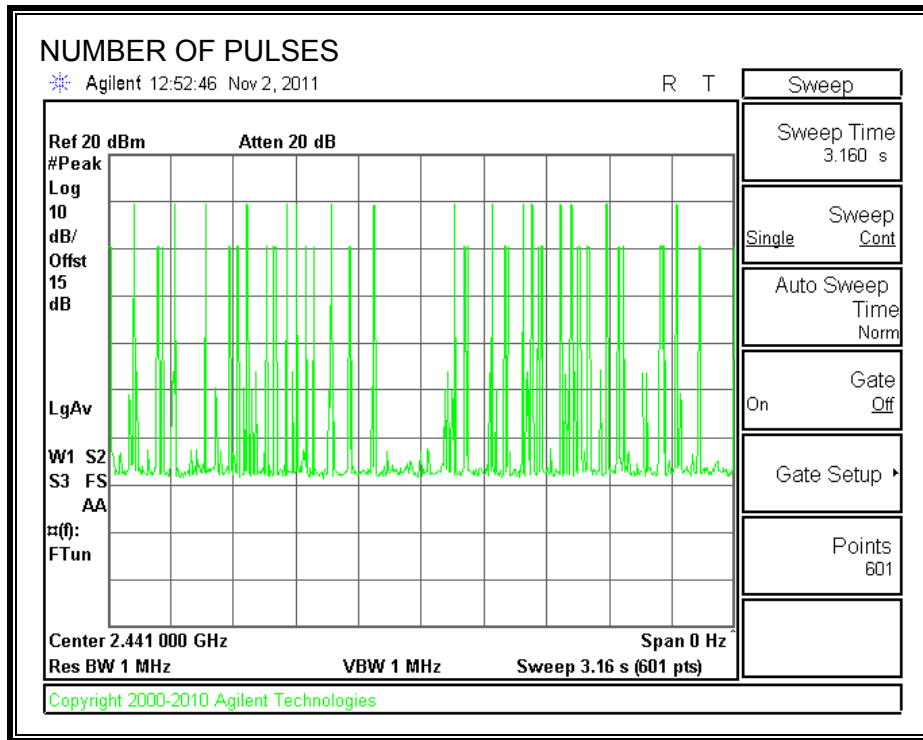


**DH3**

**PULSE WIDTH**

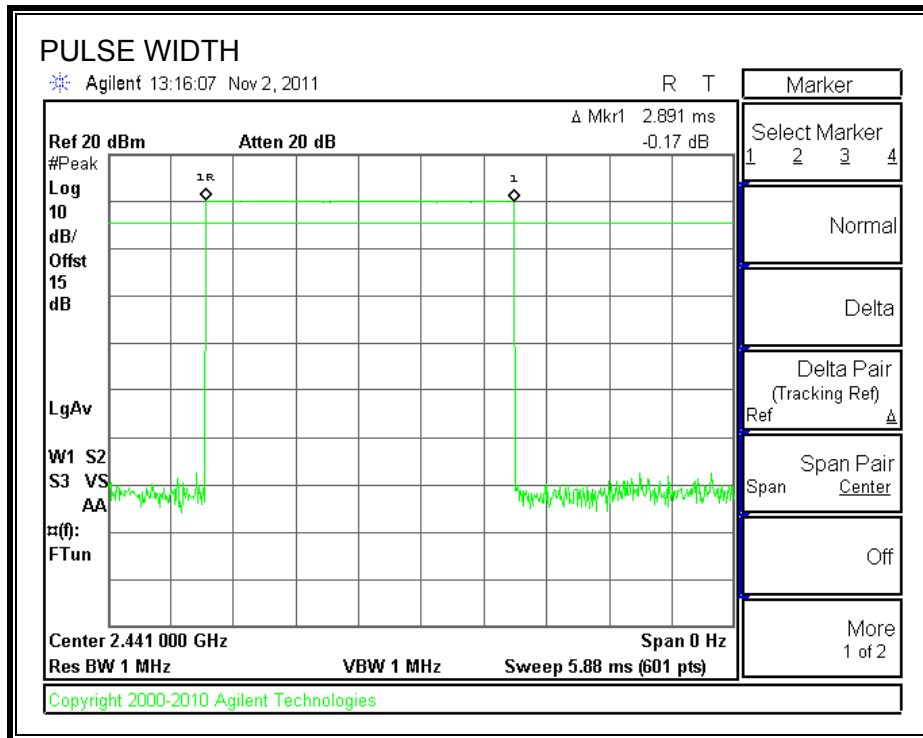


**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

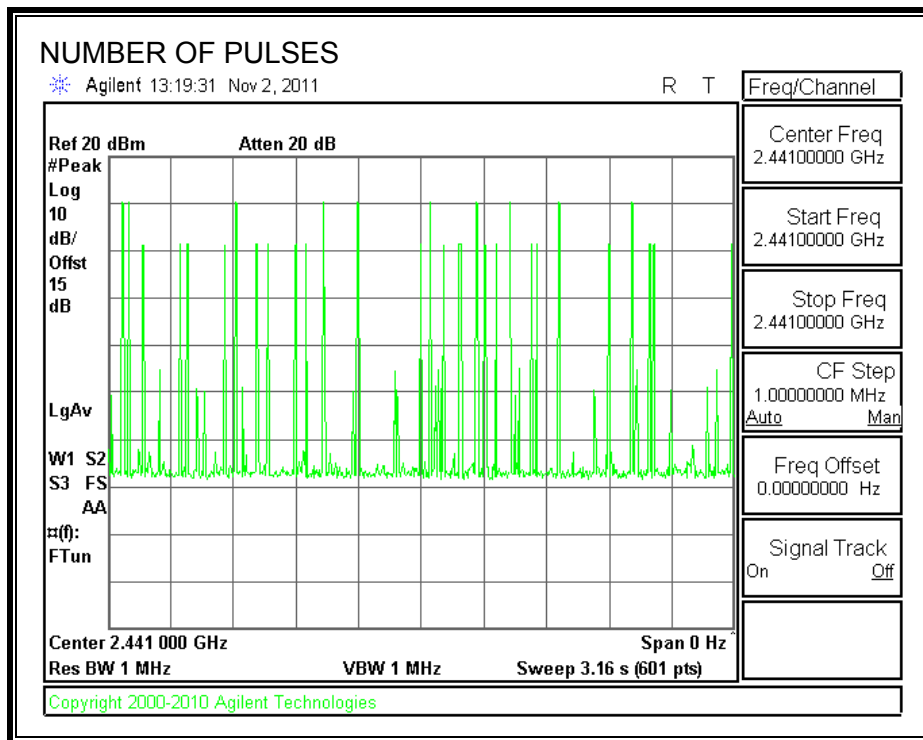


**DH5**

**PULSE WIDTH**



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**



### 7.1.5. OUTPUT POWER

#### LIMIT

§15.247 (b) (1)

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

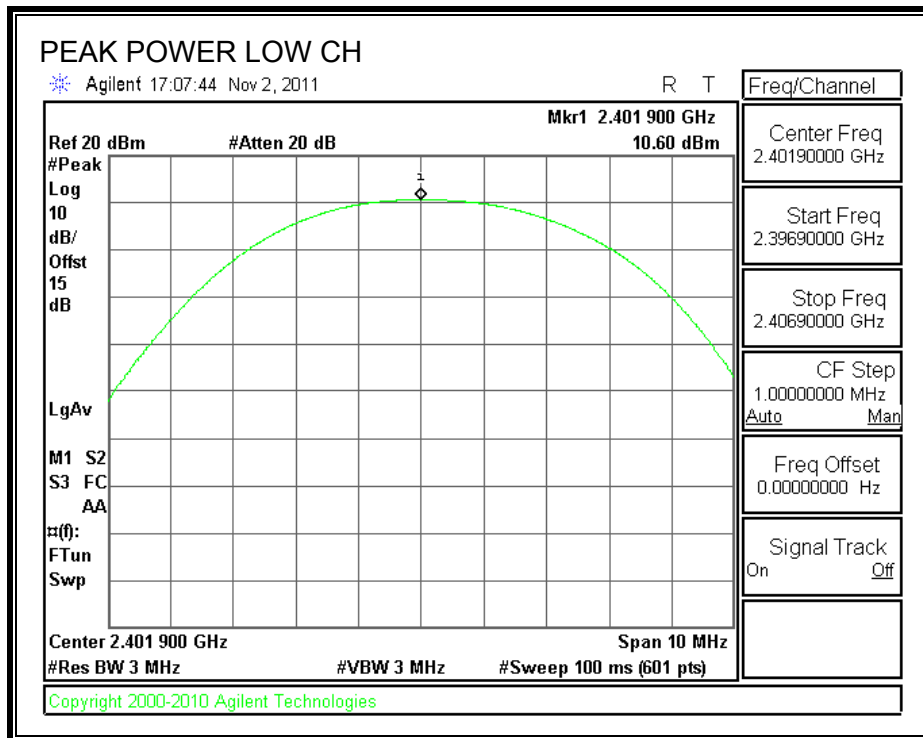
#### TEST PROCEDURE

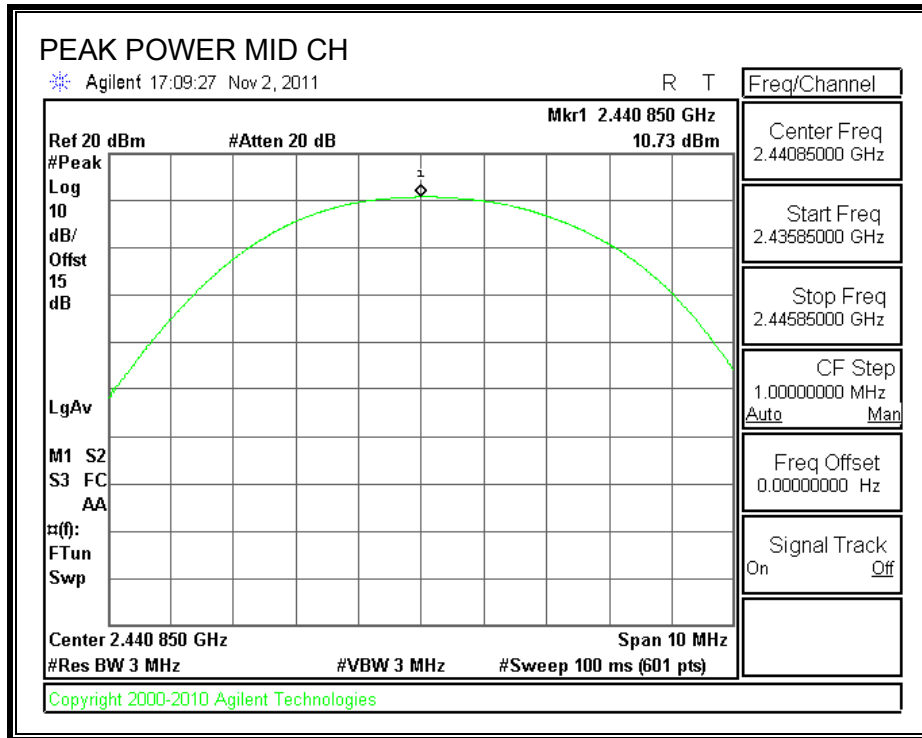
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

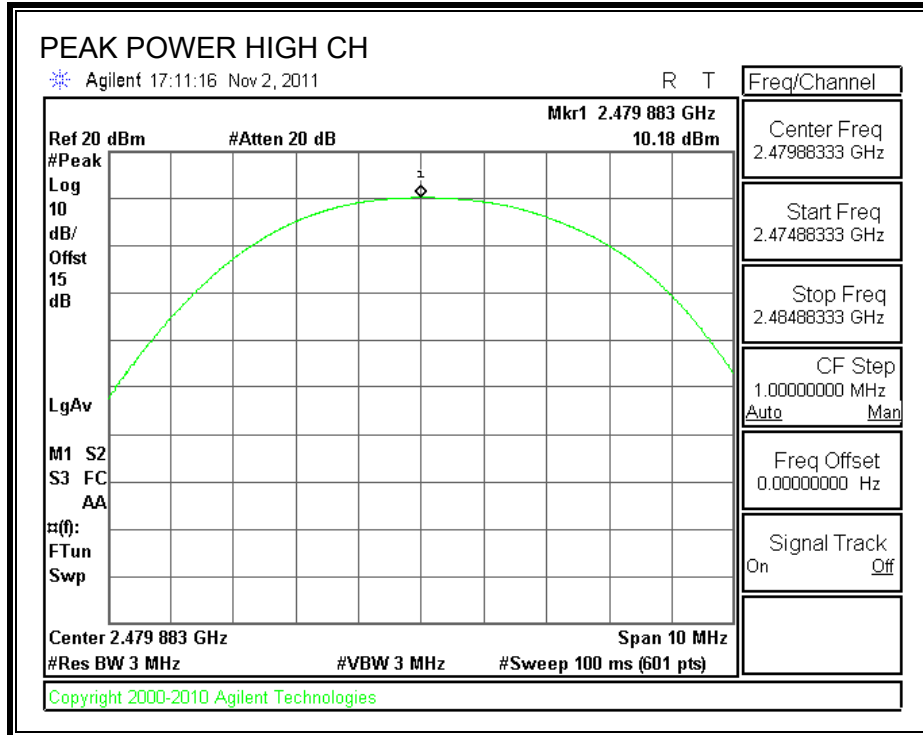
#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.60	30	-19.40
Middle	2441	10.73	30	-19.27
High	2480	10.18	30	-19.82

**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 10.4 dB (including 10 dB pad and 0.4 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	9.20
Middle	2441	9.20
High	2480	9.20

## **7.1.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

Limit = -20 dBc

### **TEST PROCEDURE**

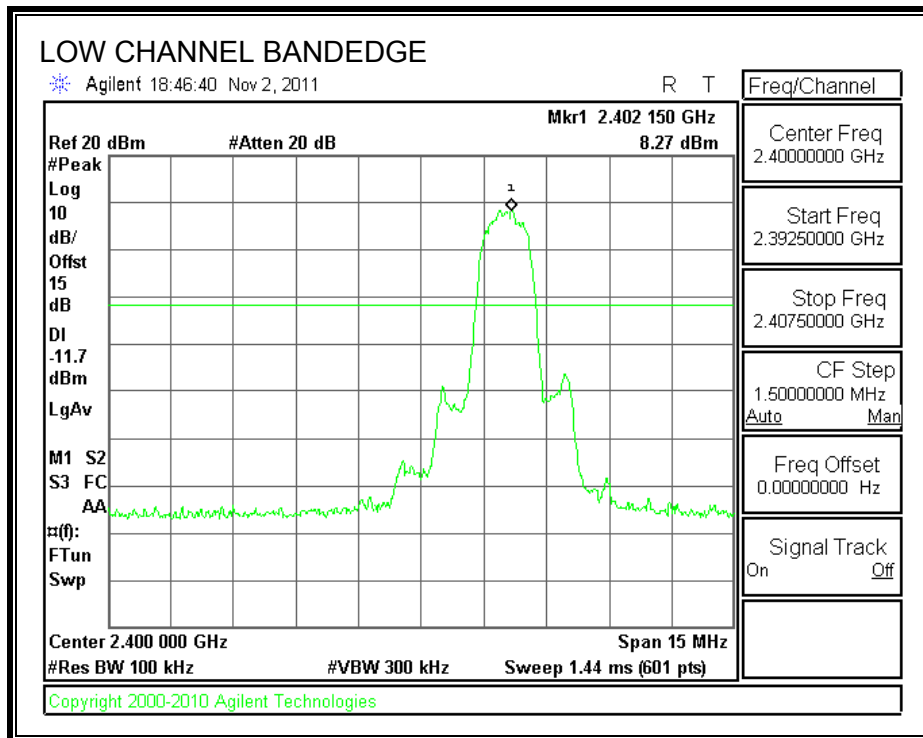
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

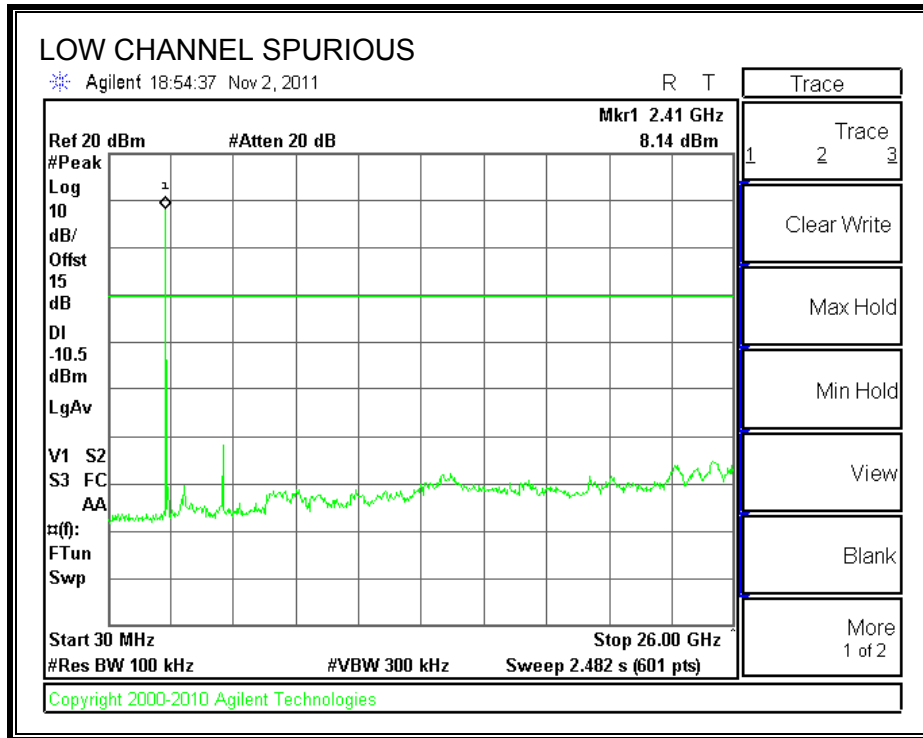
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

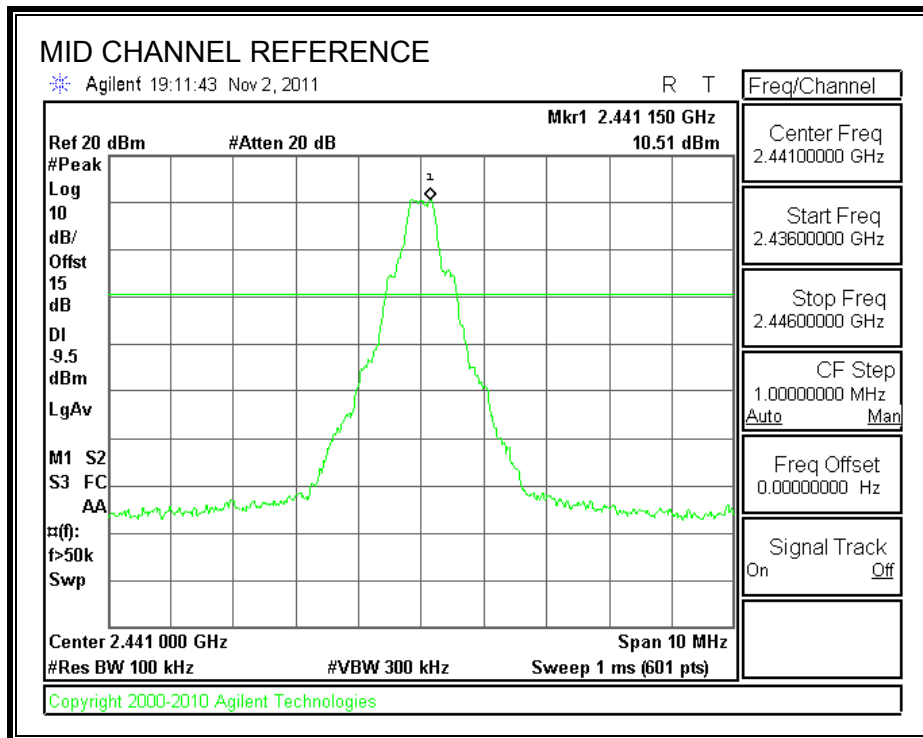
### **RESULTS**

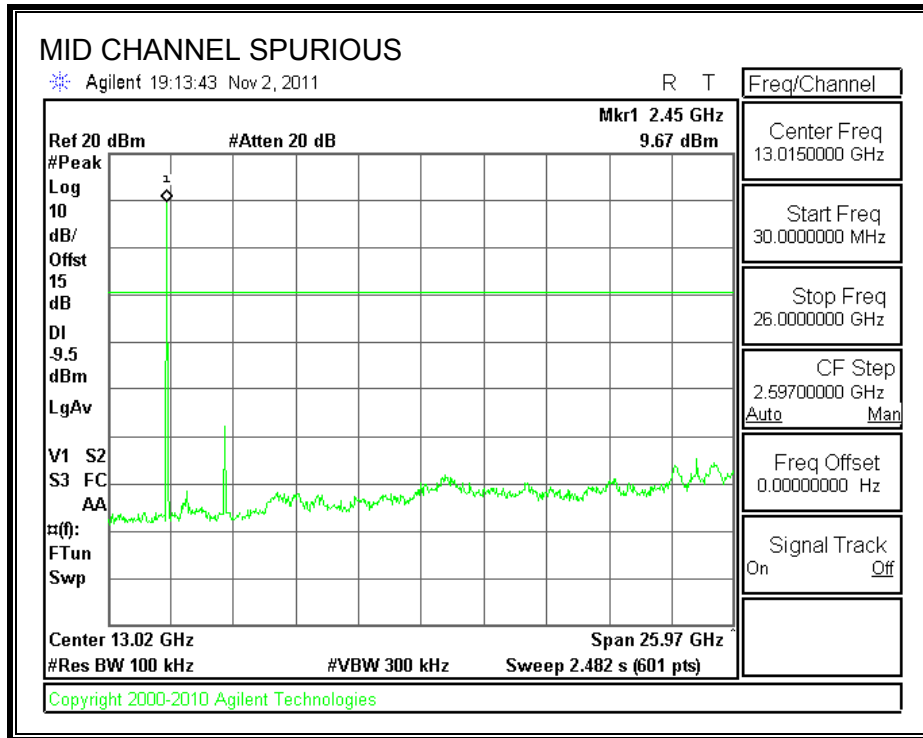
**SPURIOUS EMISSIONS, LOW CHANNEL**



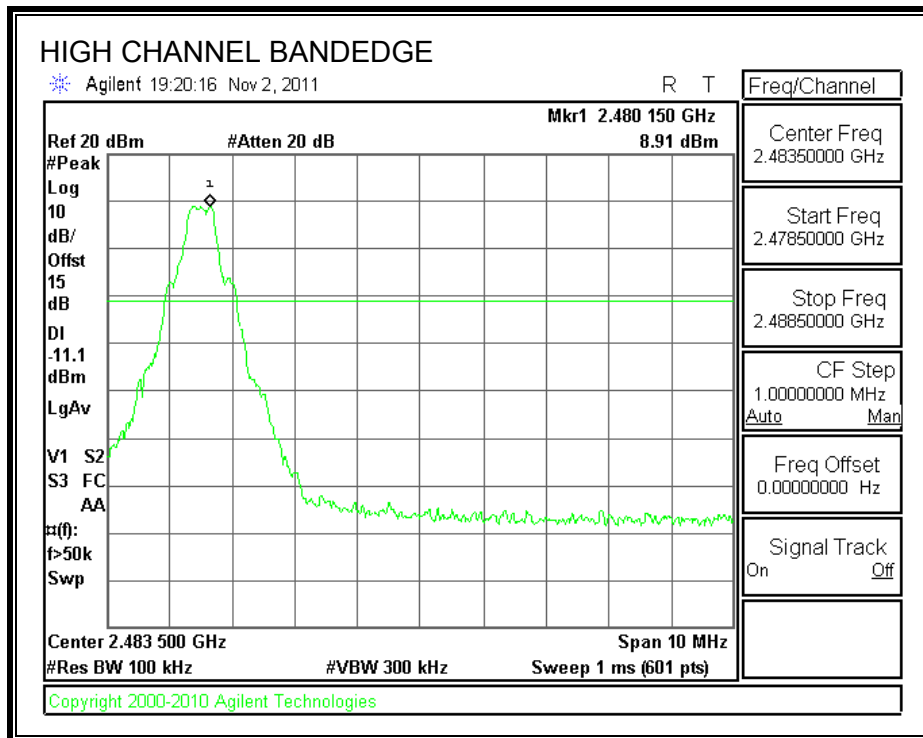


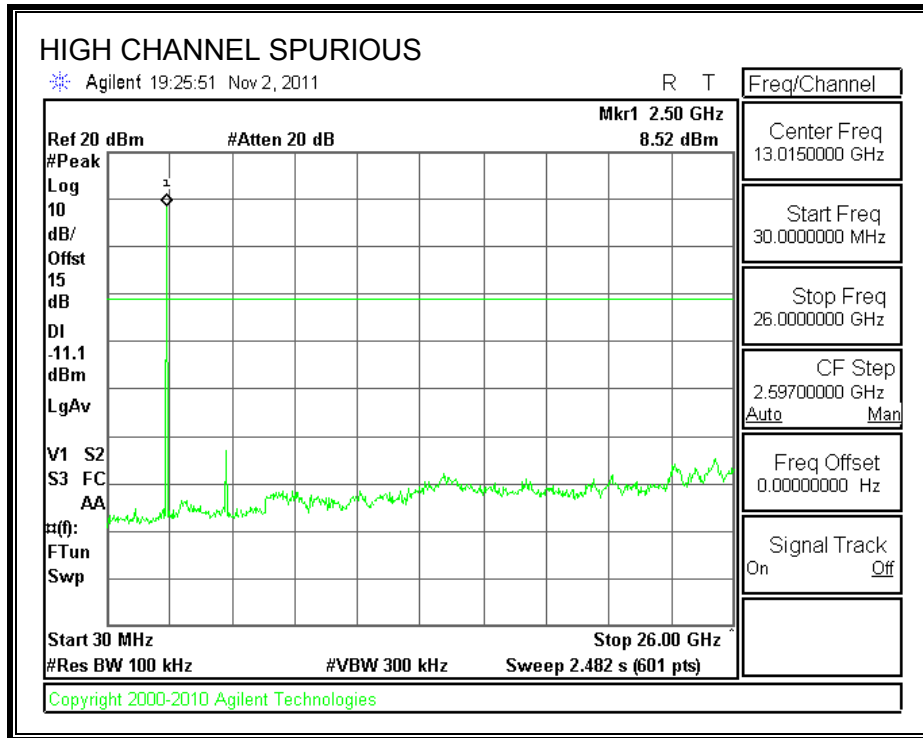
**SPURIOUS EMISSIONS, MID CHANNEL**





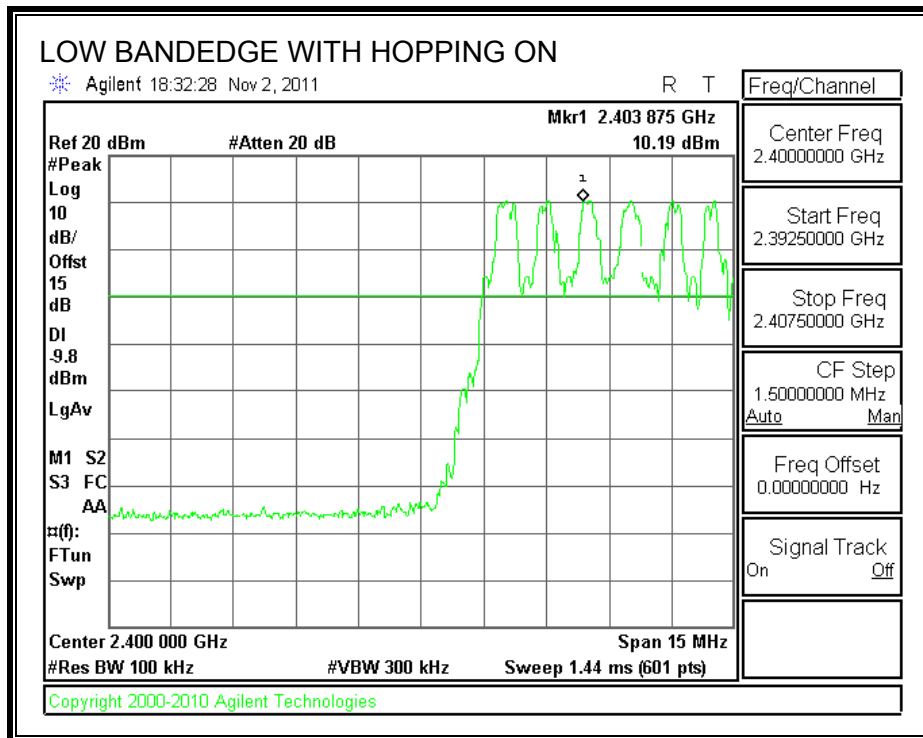
**SPURIOUS EMISSIONS, HIGH CHANNEL**

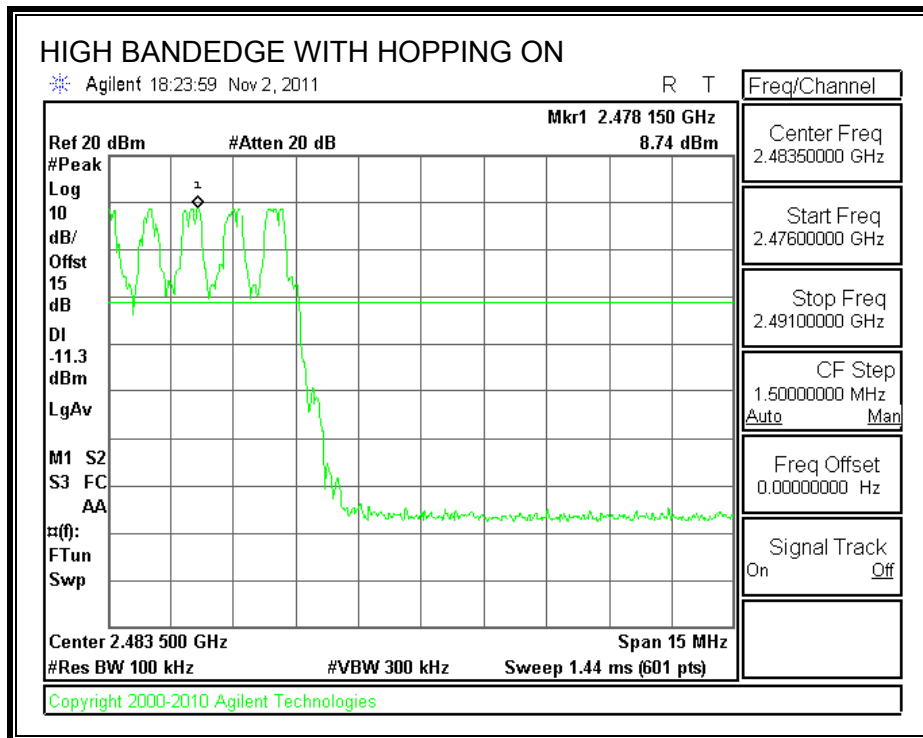






**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**





## 7.2. ENHANCED DATA RATE 8PSK MODULATION

### 7.2.1. 20 dB BANDWIDTH

#### LIMIT

None; for reporting purposes only.

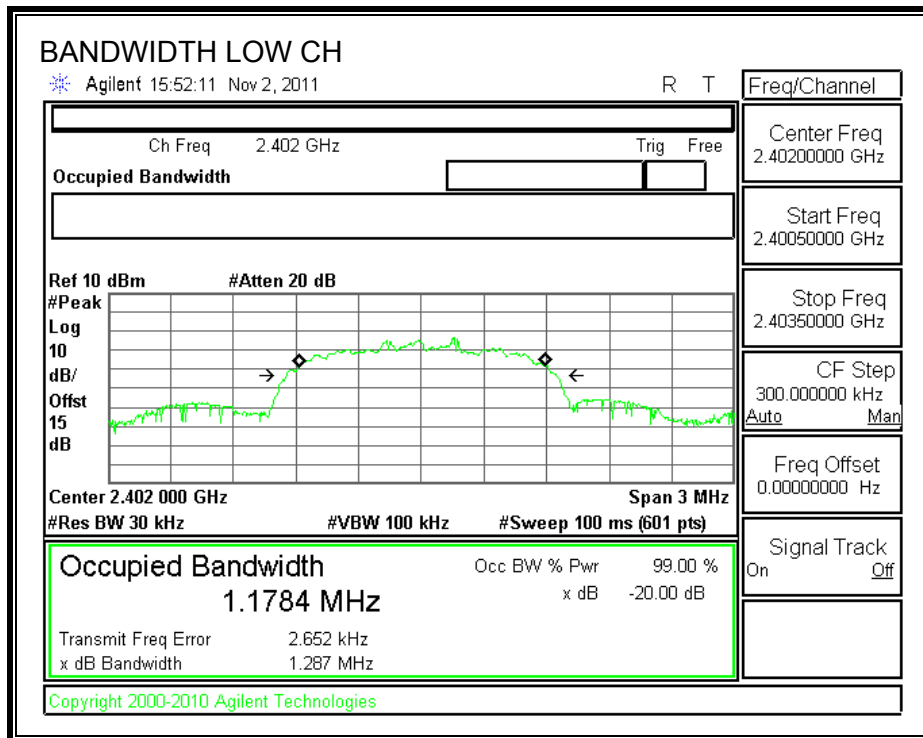
#### TEST PROCEDURE

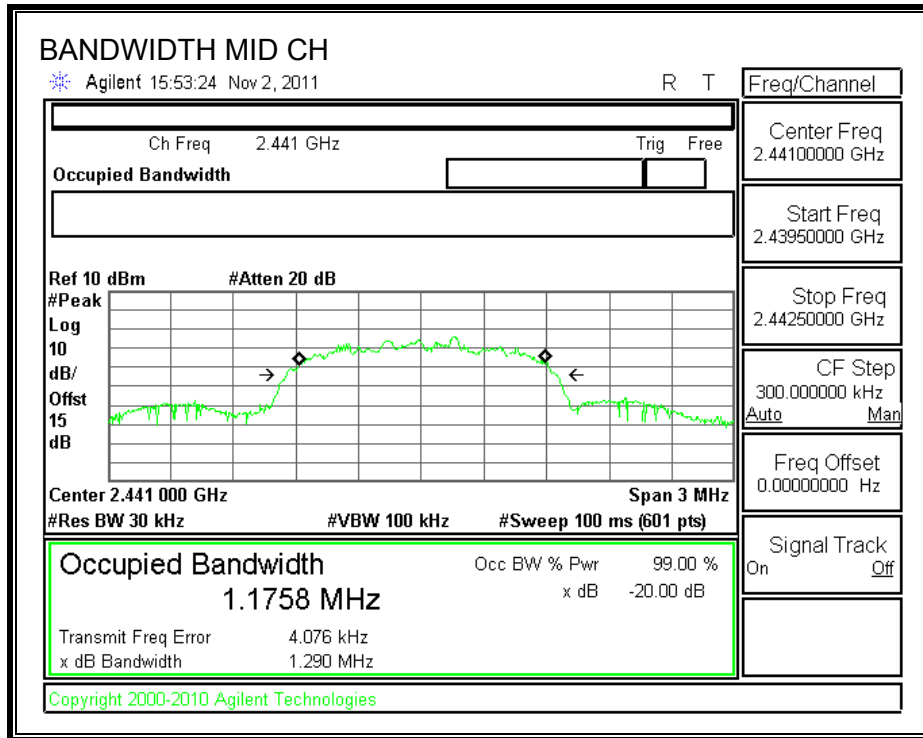
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

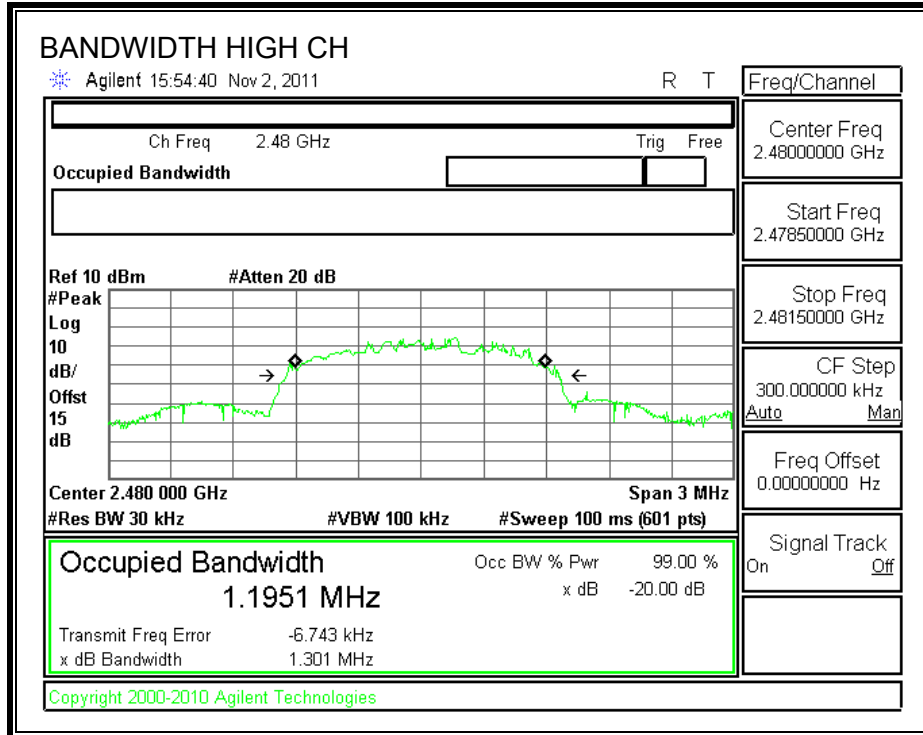
#### RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (MHz)
Low	2402	1.287
Middle	2441	1.29
High	2480	1.301

**20 dB BANDWIDTH**







## **7.2.2. HOPPING FREQUENCY SEPARATION**

### **LIMIT**

FCC §15.247 (a) (1)

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

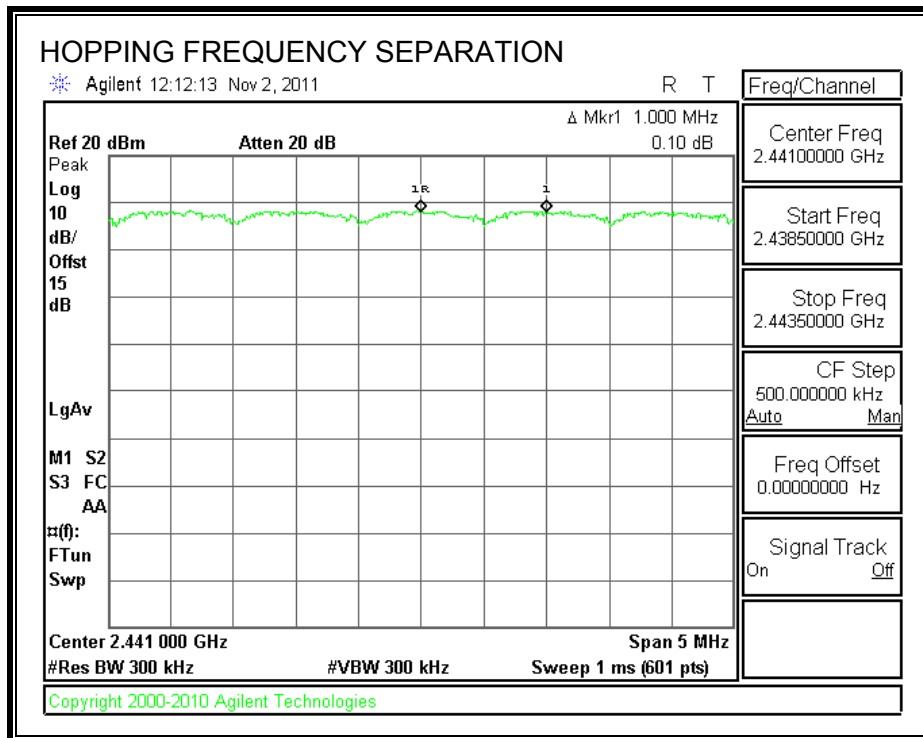
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

### **TEST PROCEDURE**

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

### **RESULTS**

**HOPPING FREQUENCY SEPARATION**





### **7.2.3. NUMBER OF HOPPING CHANNELS**

#### **LIMIT**

FCC §15.247 (a) (1) (iii)

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

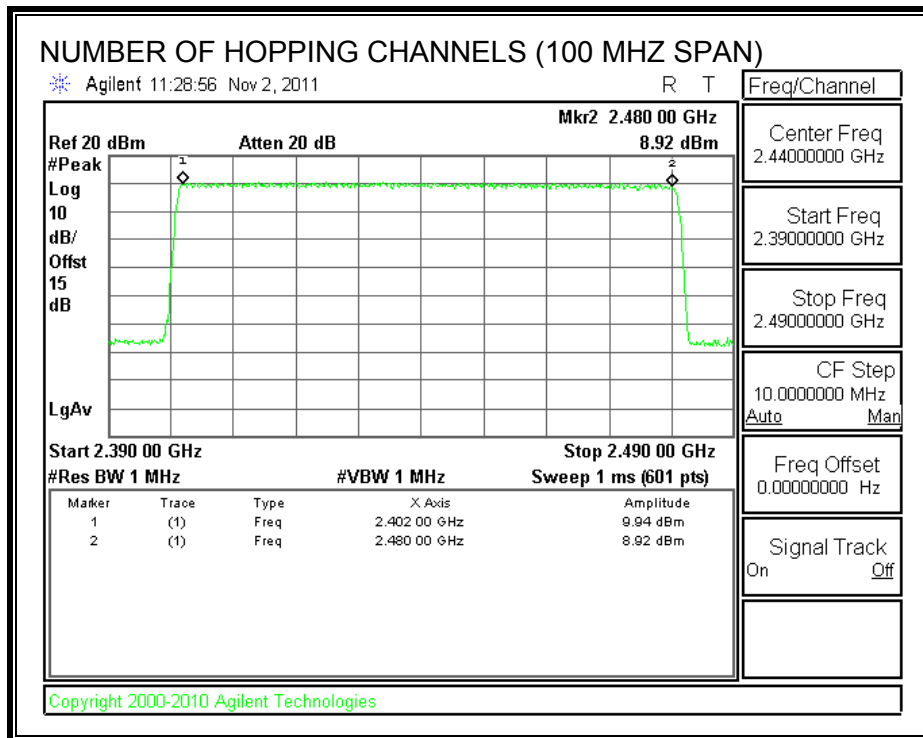
#### **TEST PROCEDURE**

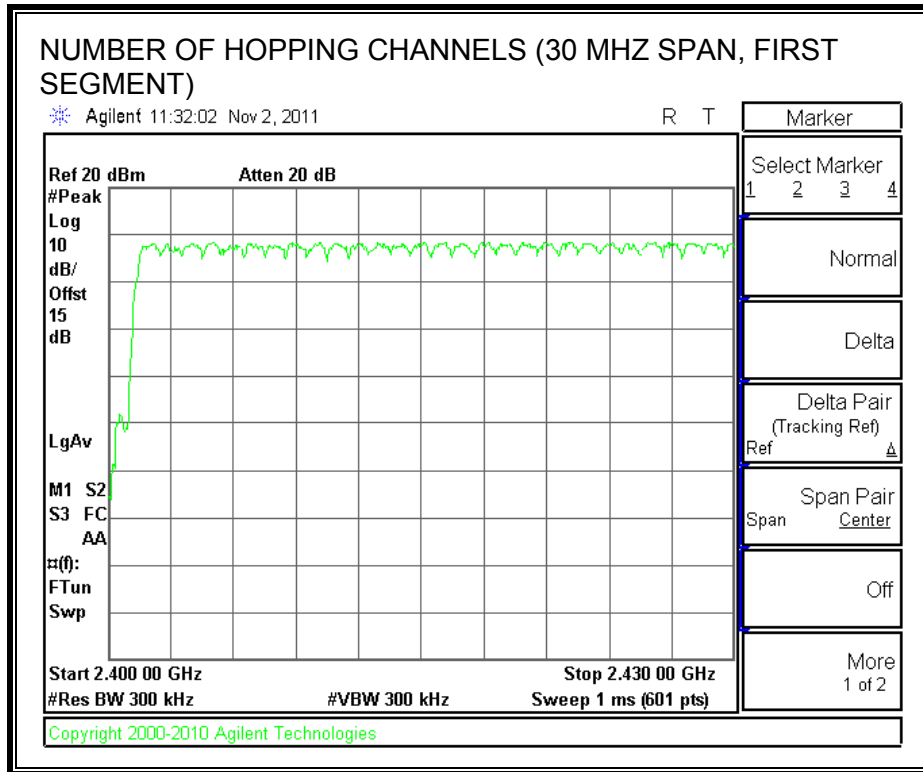
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

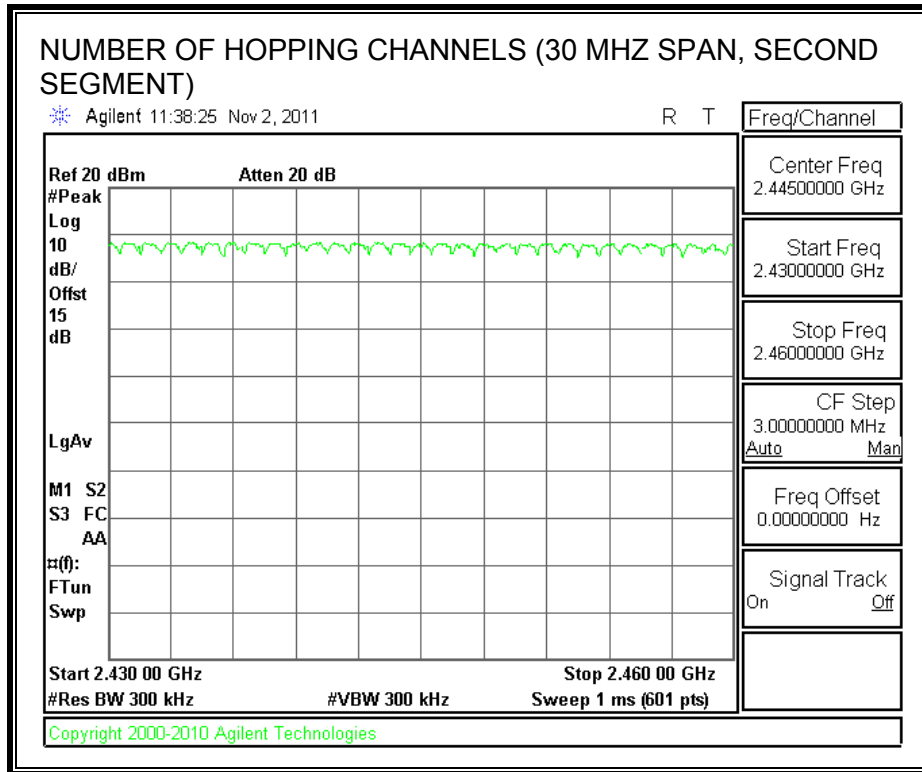
#### **RESULTS**

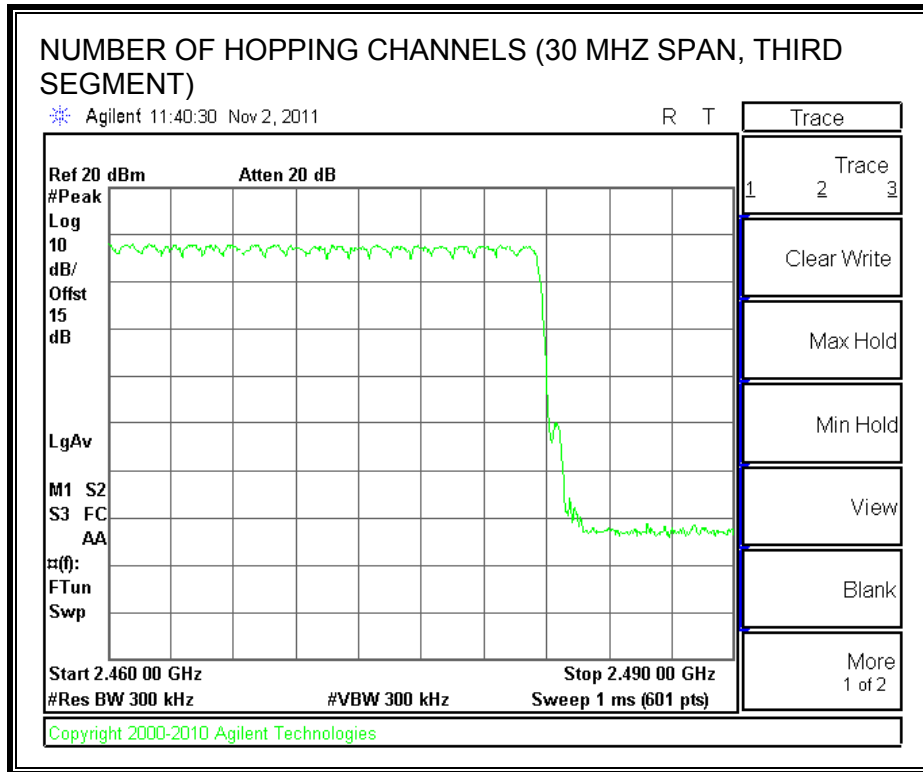
79 Channels observed.

**NUMBER OF HOPPING CHANNELS**









## 7.2.4. AVERAGE TIME OF OCCUPANCY

### LIMIT

FCC §15.247 (a) (1) (iii)

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  $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$ .

### RESULTS

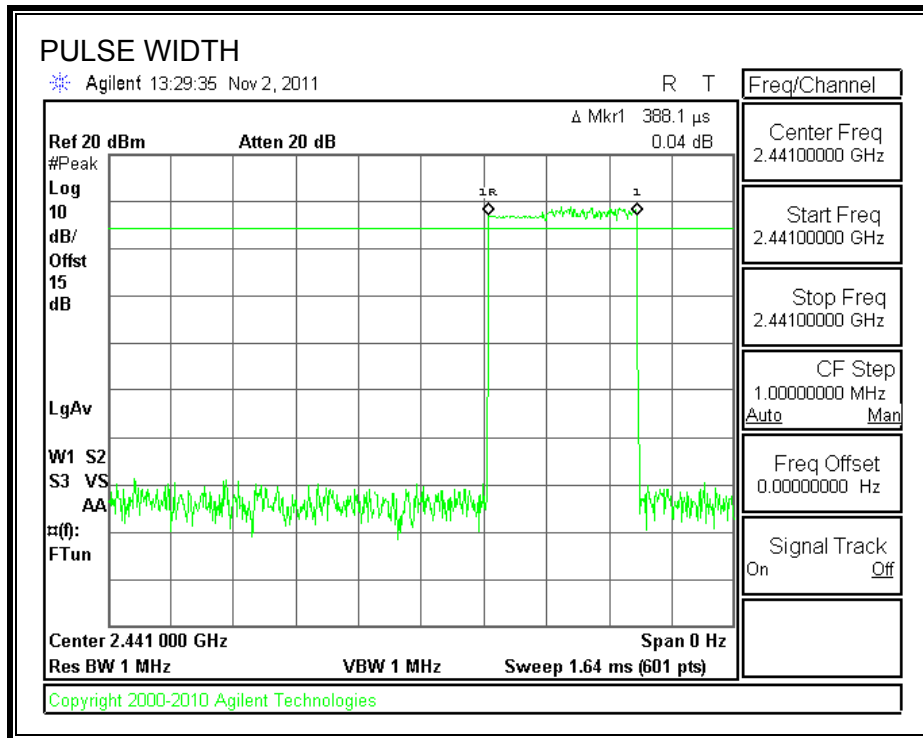
Time Of Occupancy =  $10 * xx \text{ pulses} * yy \text{ msec} = zz \text{ msec}$

#### 8PSK Mode

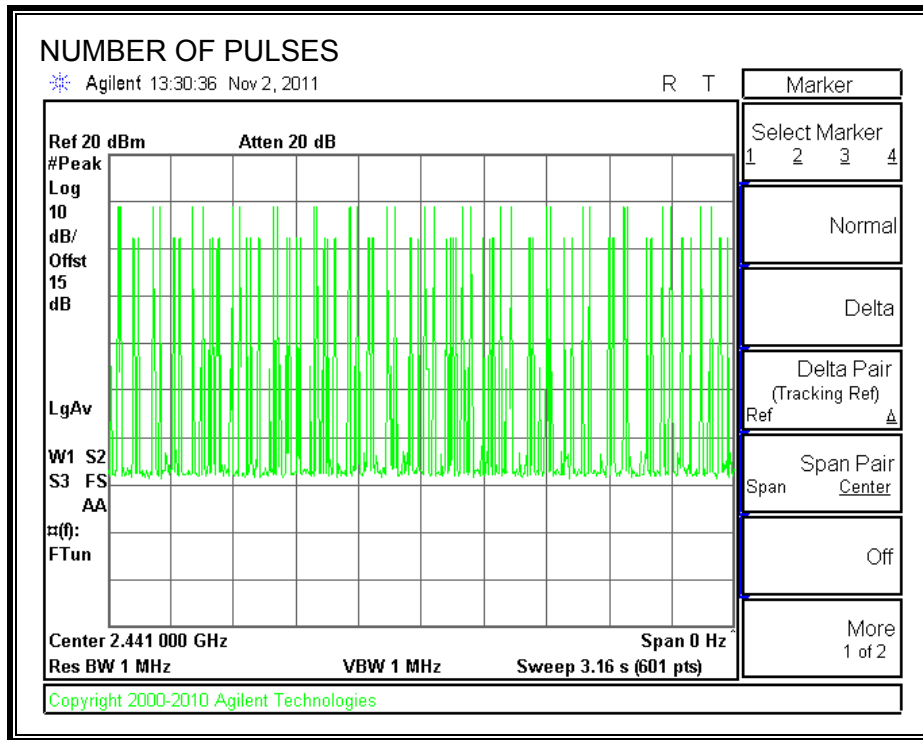
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.3881	31	0.120	0.4	-0.280
DH3	1.635	17	0.278	0.4	-0.122
DH5	2.9	10	0.290	0.4	-0.110

**DH1**

**PULSE WIDTH**



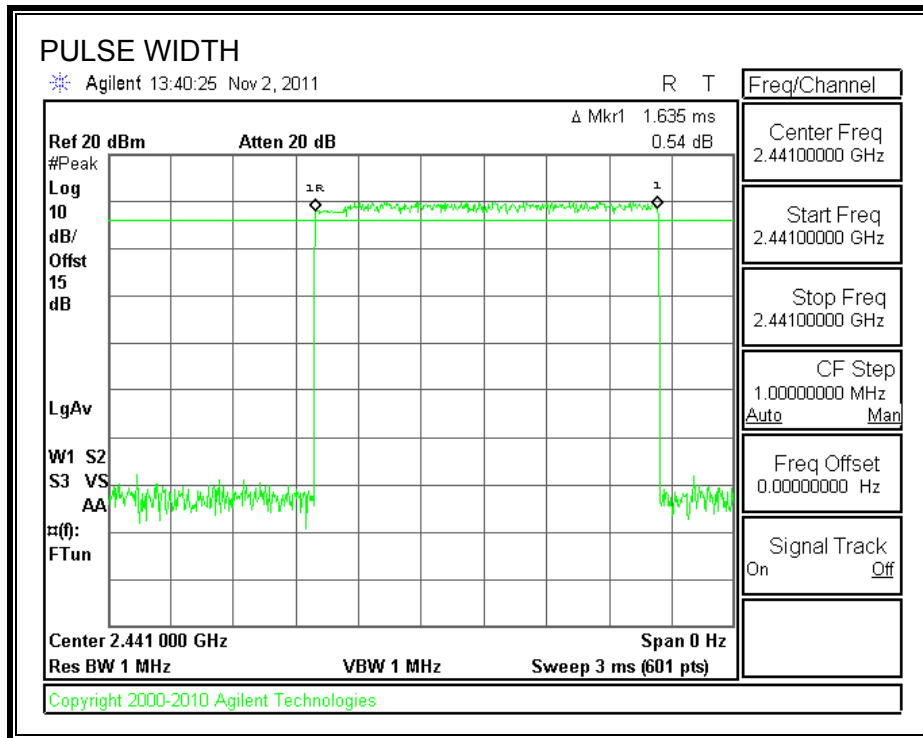
**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**



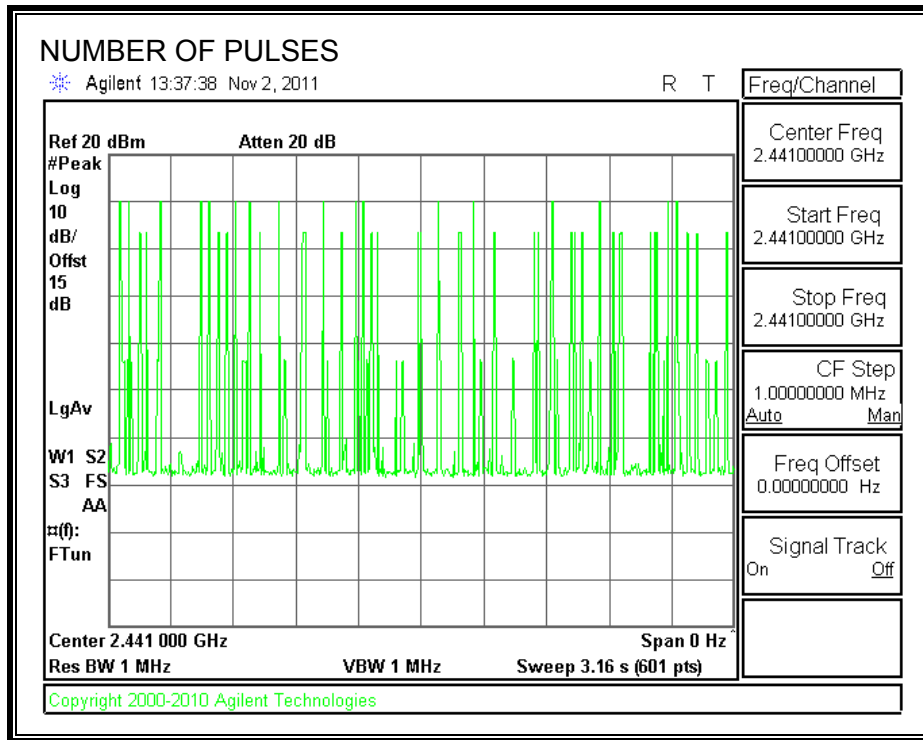


**DH3**

**PULSE WIDTH**

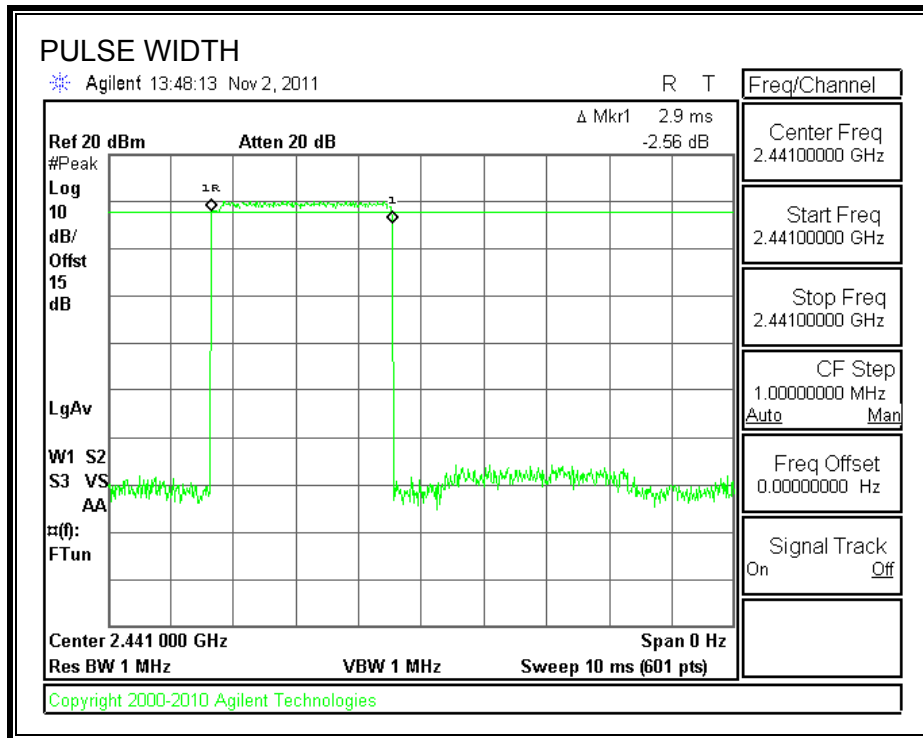


**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

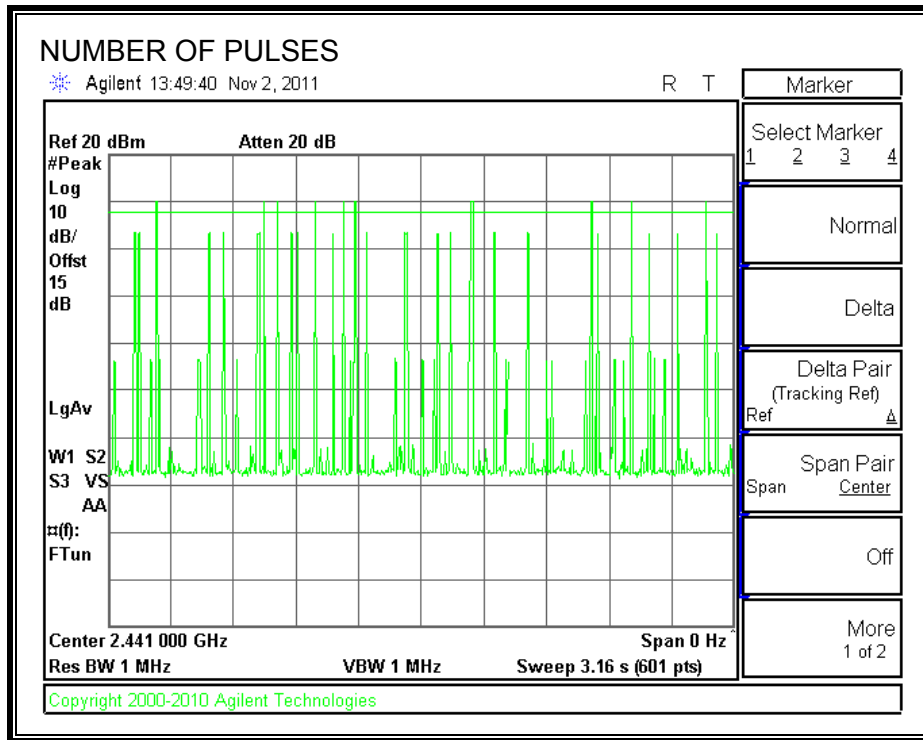


**DH5**

**PULSE WIDTH**



**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**



## 7.2.5. OUTPUT POWER

### LIMIT

§15.247 (b) (1)

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

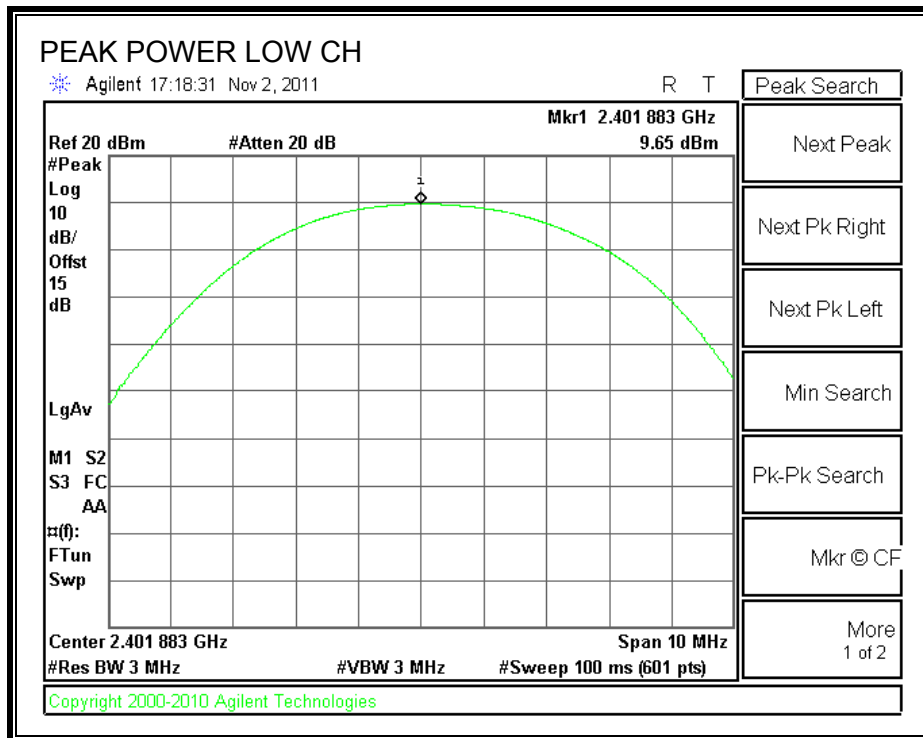
### TEST PROCEDURE

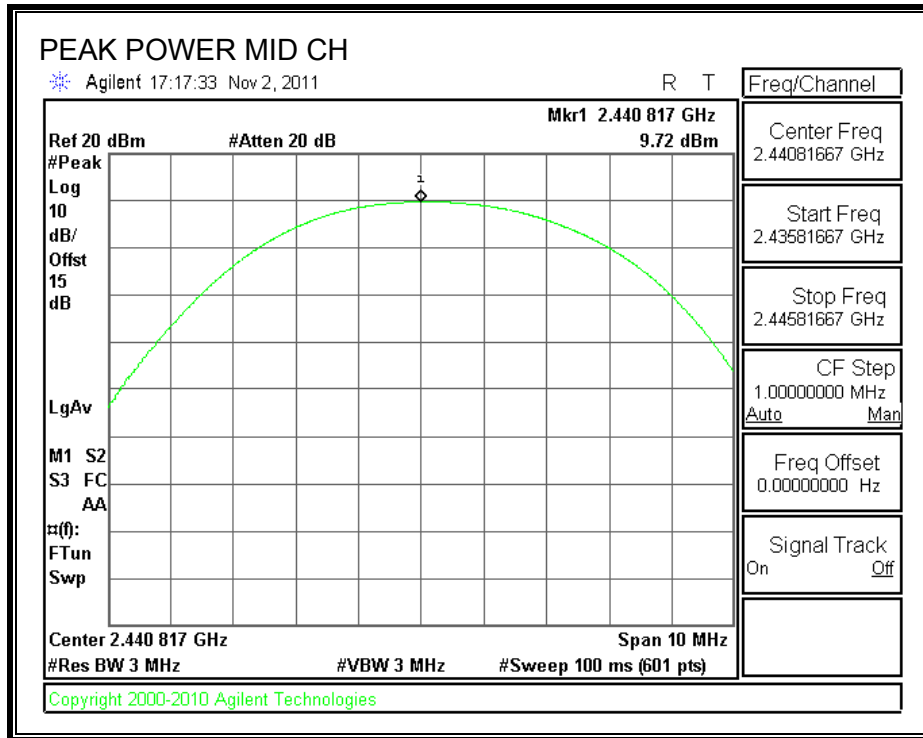
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

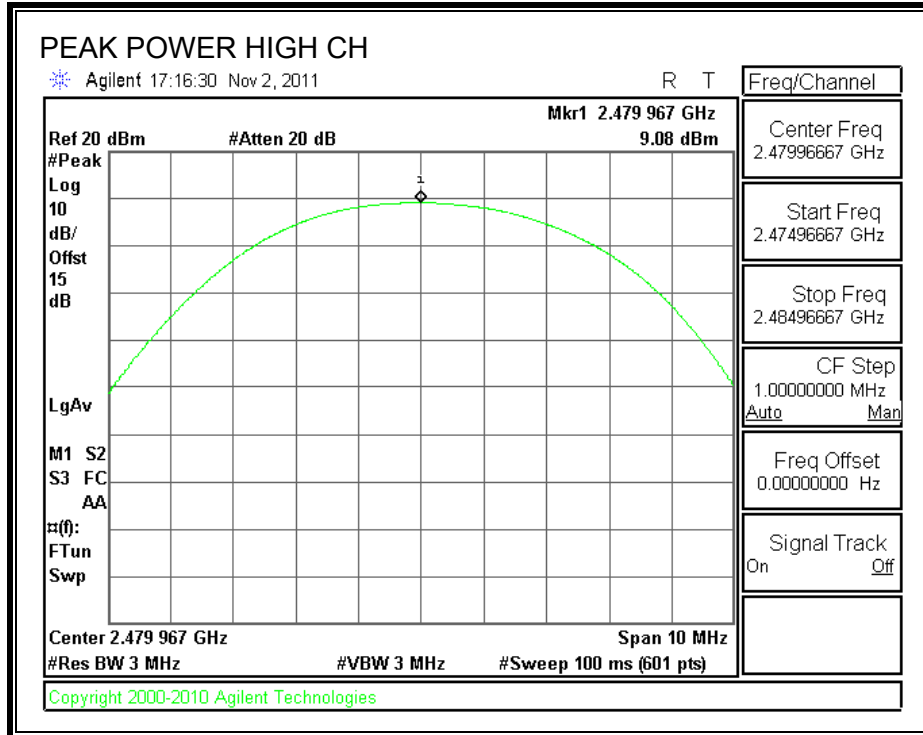
### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	9.65	30	-20.35
Middle	2441	9.72	30	-20.28
High	2480	9.08	30	-20.92

**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 10.4 dB (including 10 dB pad and 0.4 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	6.80
Middle	2441	6.90
High	2480	6.90

## **7.2.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

Limit = -20 dBc

### **TEST PROCEDURE**

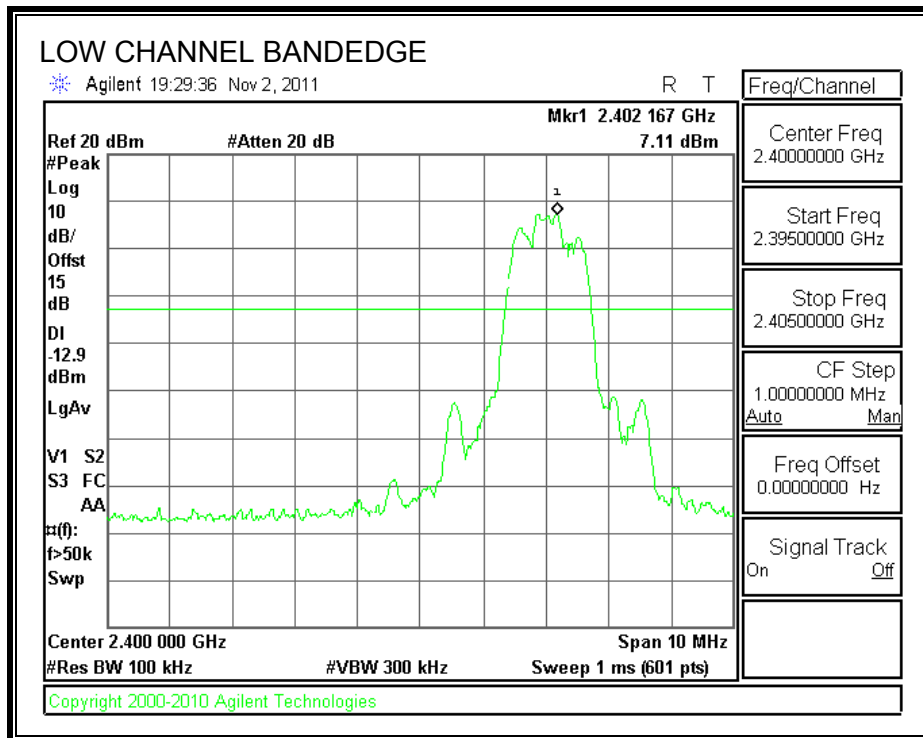
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

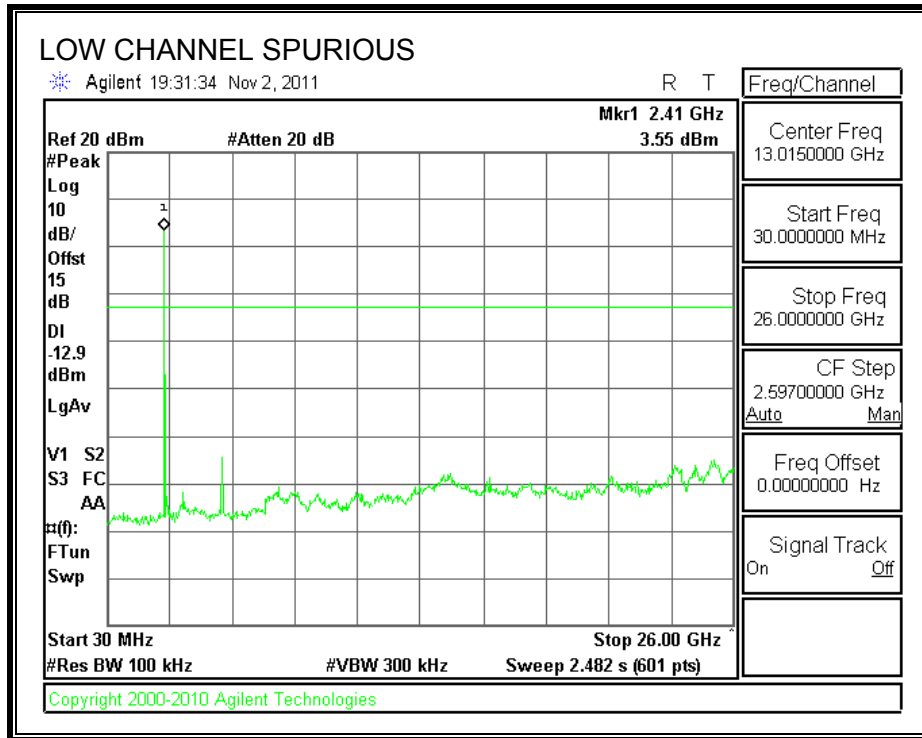
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

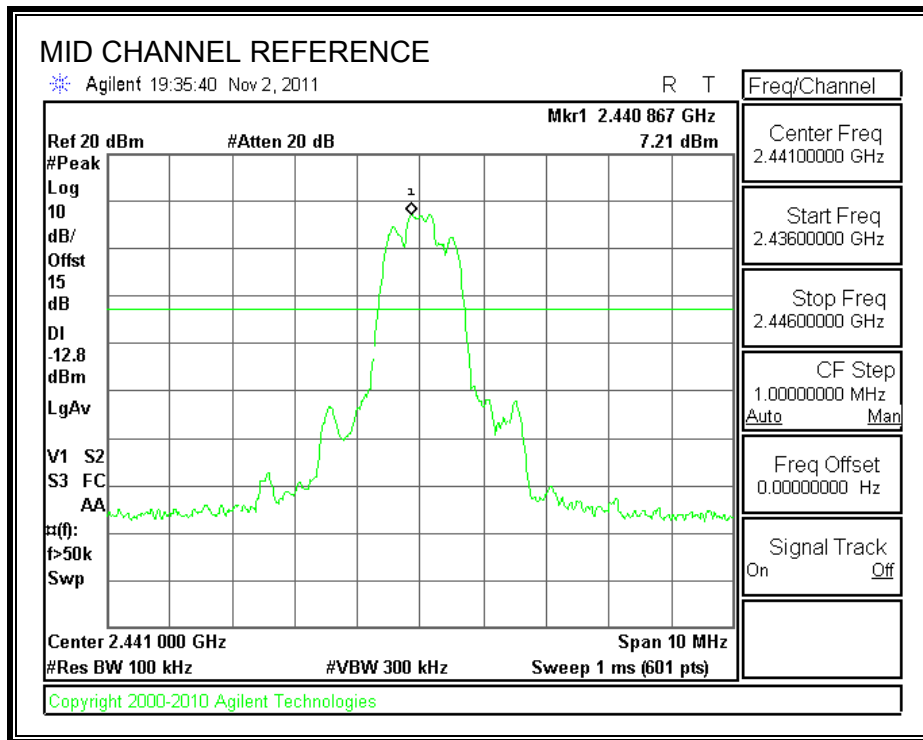
### **RESULTS**

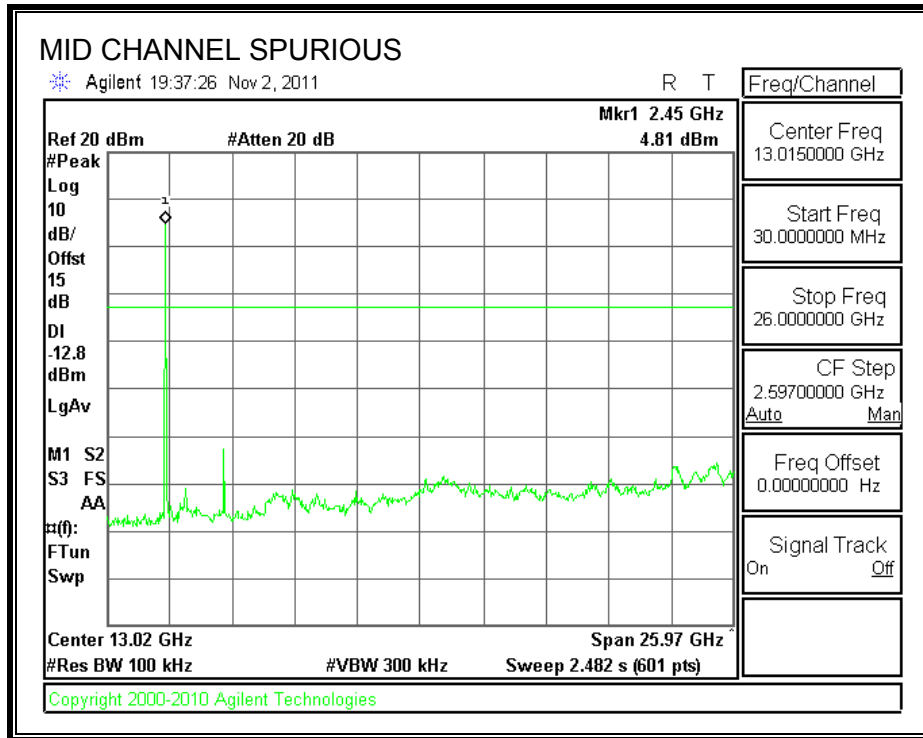
**SPURIOUS EMISSIONS, LOW CHANNEL**



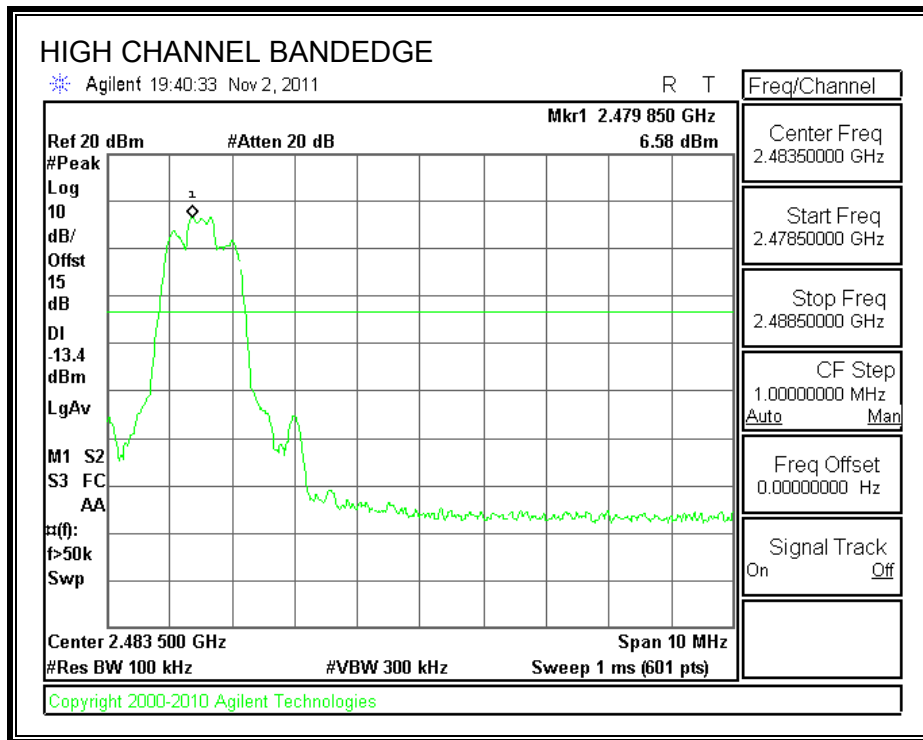


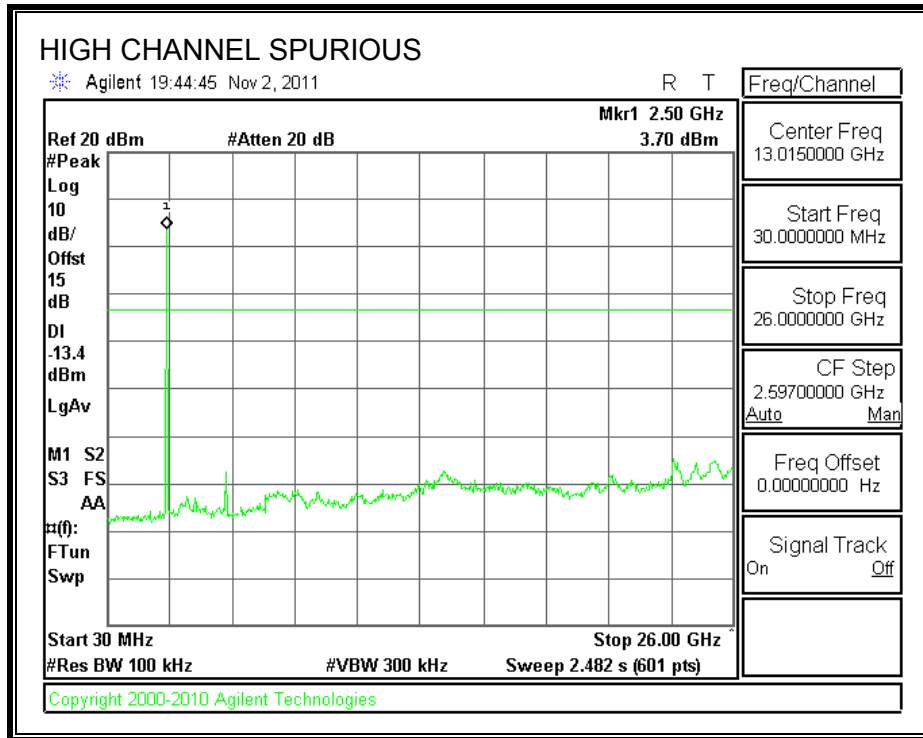
**SPURIOUS EMISSIONS, MID CHANNEL**





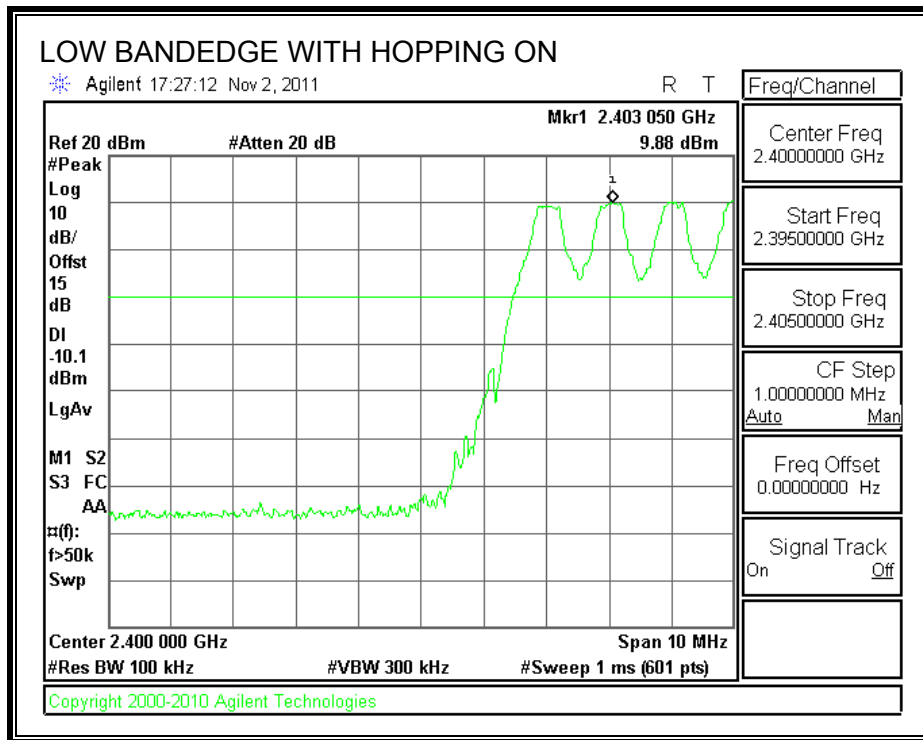
**SPURIOUS EMISSIONS, HIGH CHANNEL**

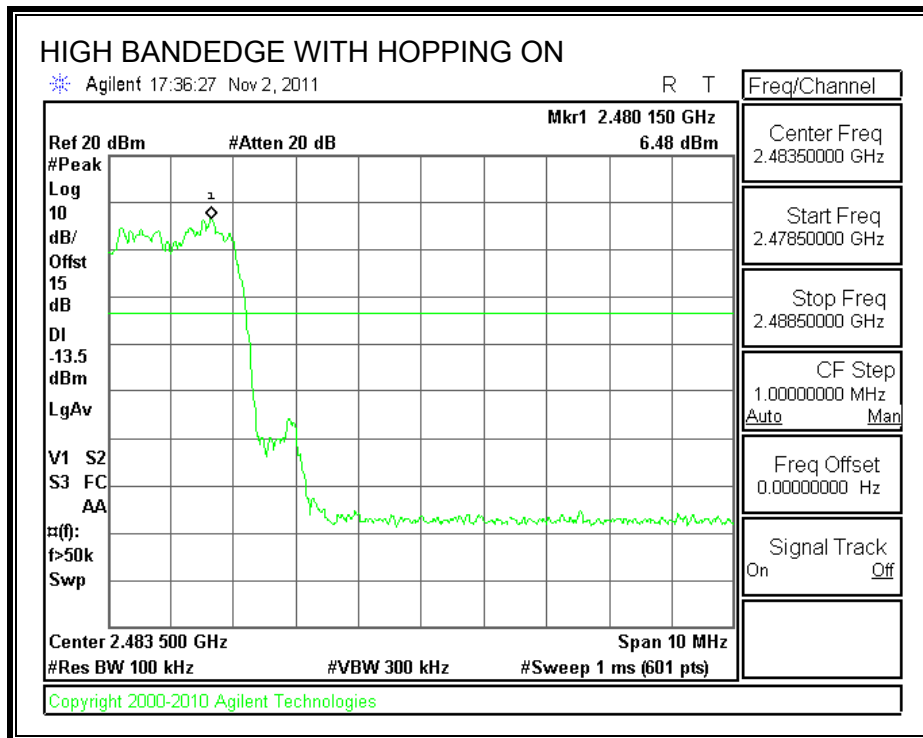






**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**





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

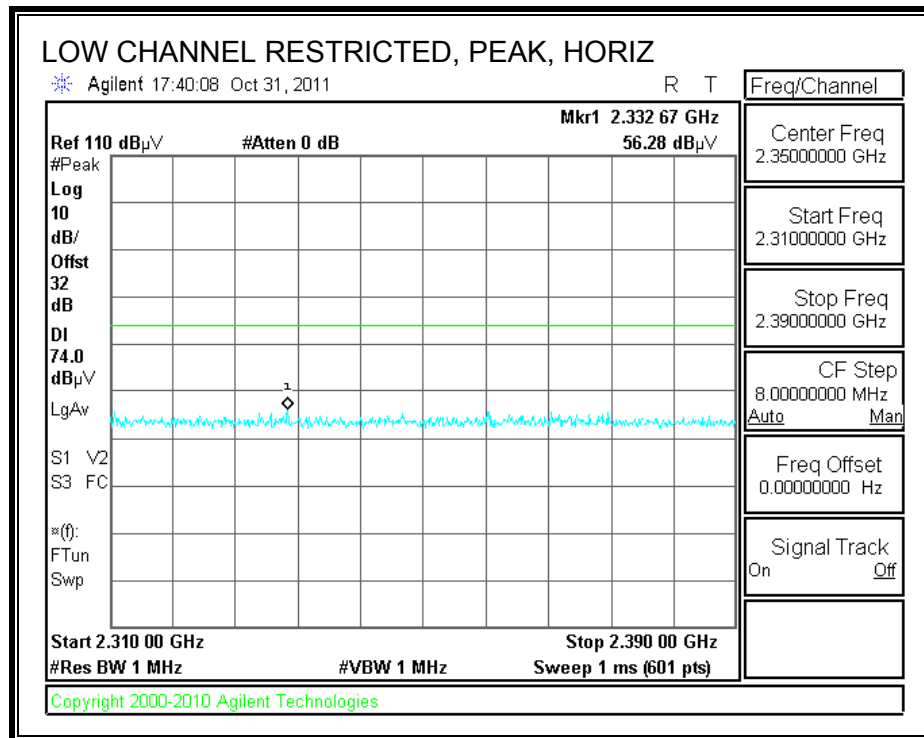
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

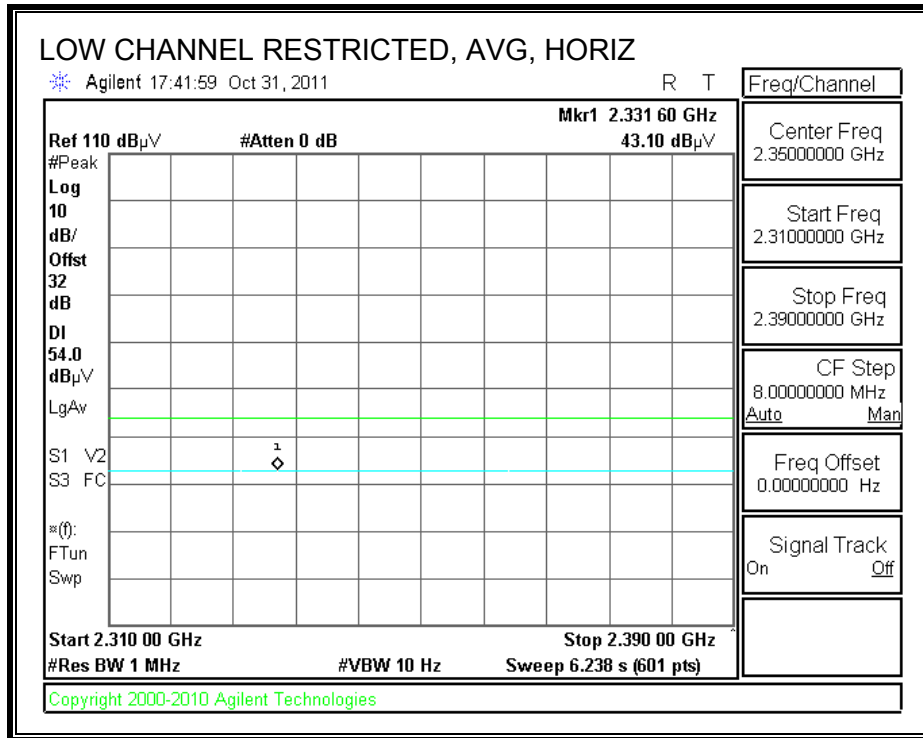
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz

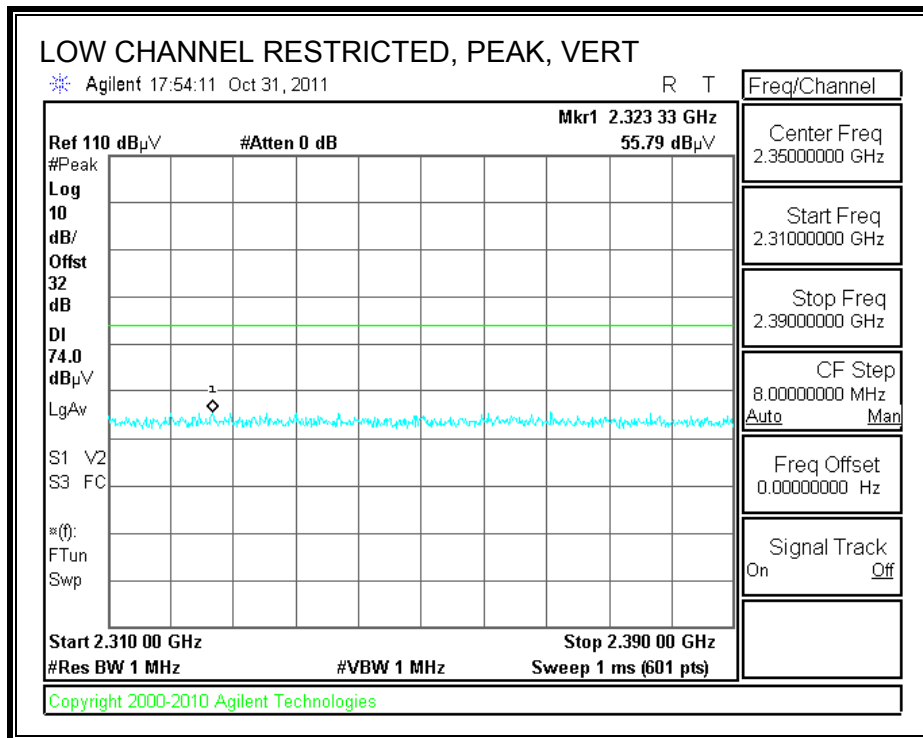
### 8.2.1. BASIC DATA RATE GFSK MODULATION

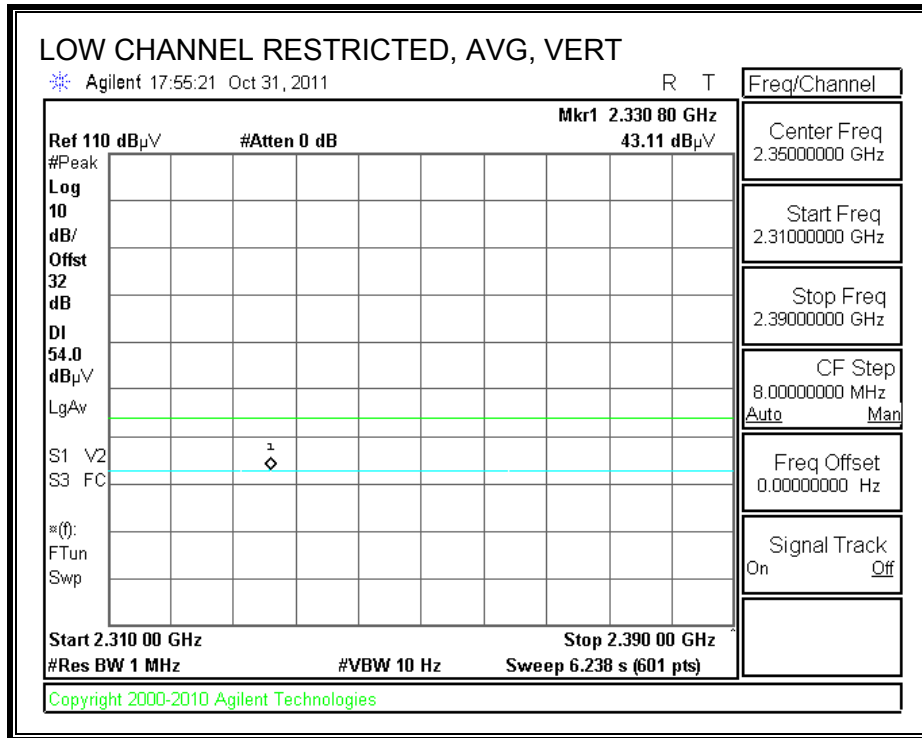
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



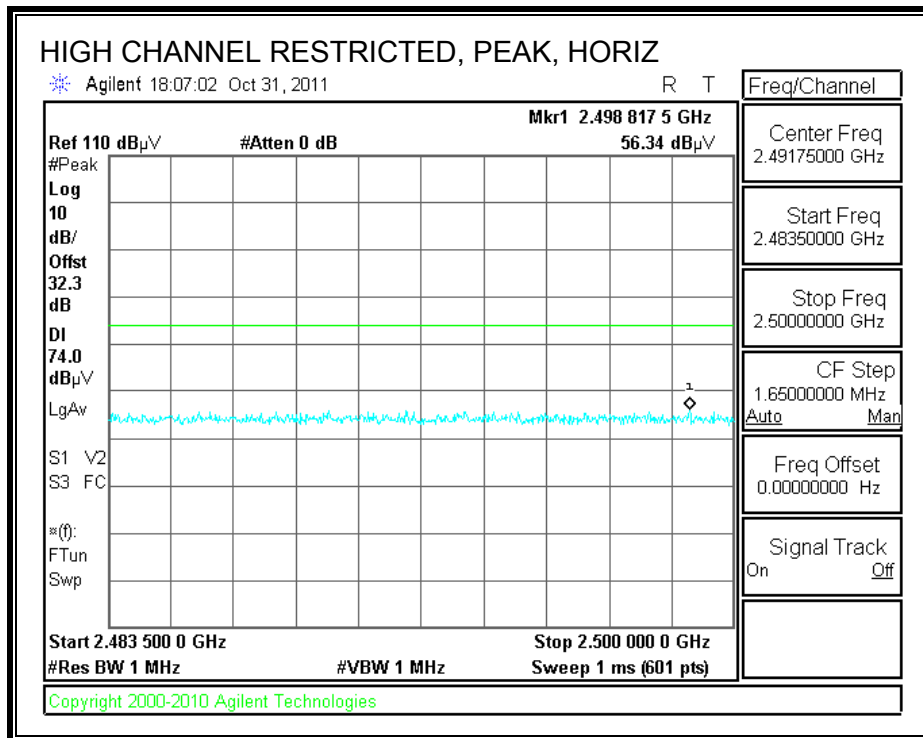


**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

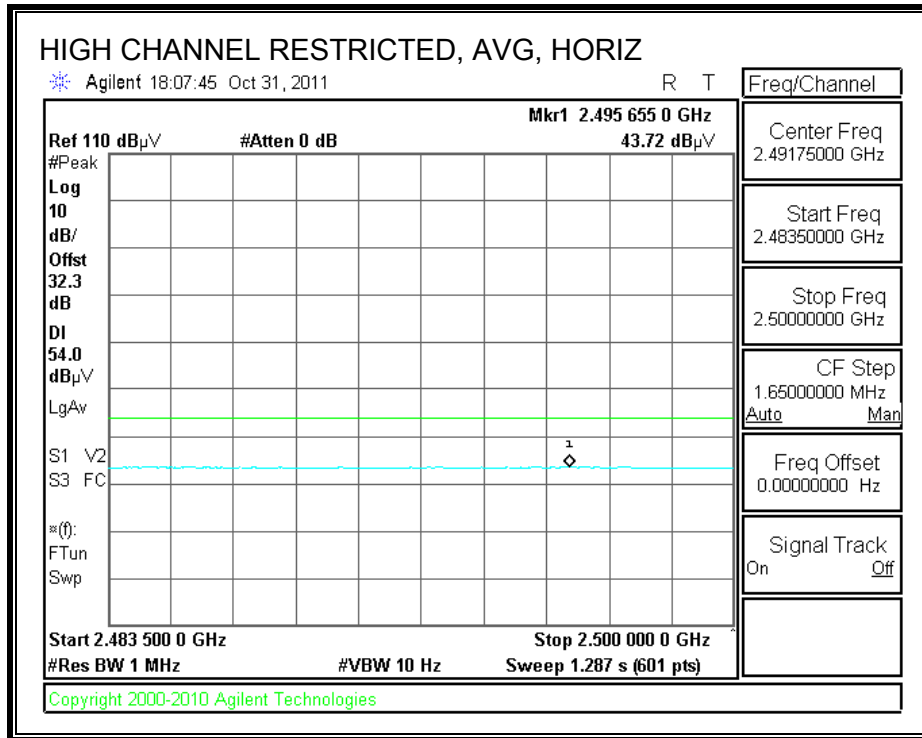




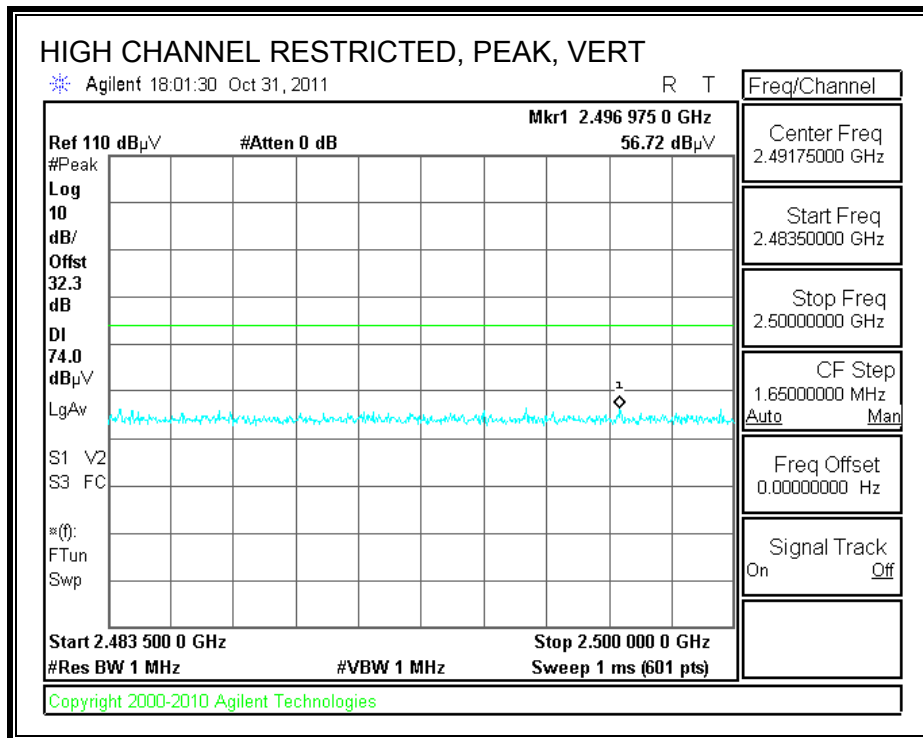
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

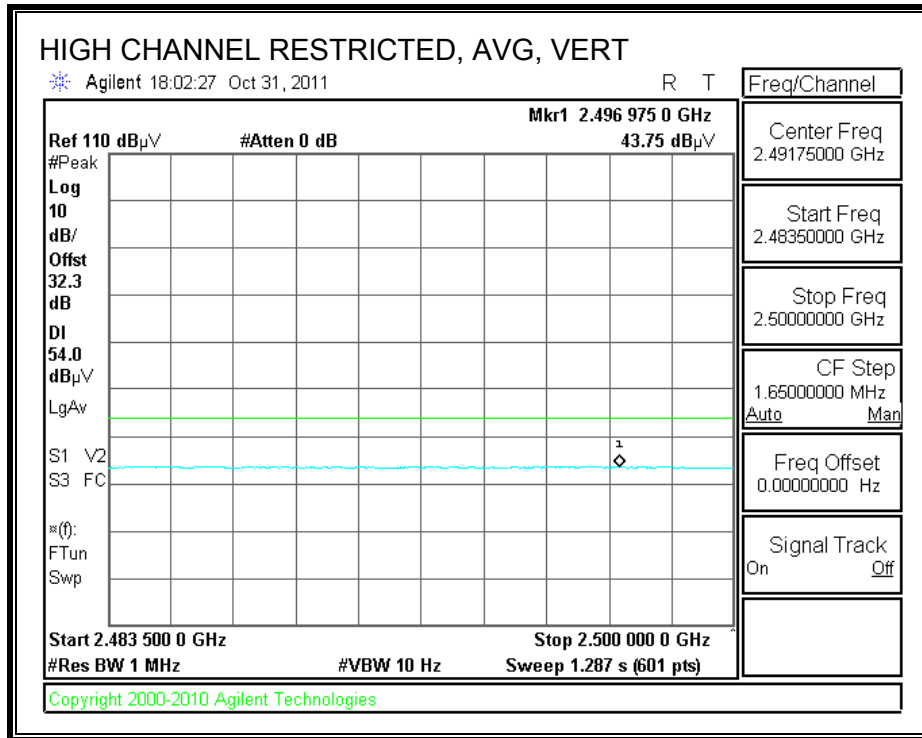






**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



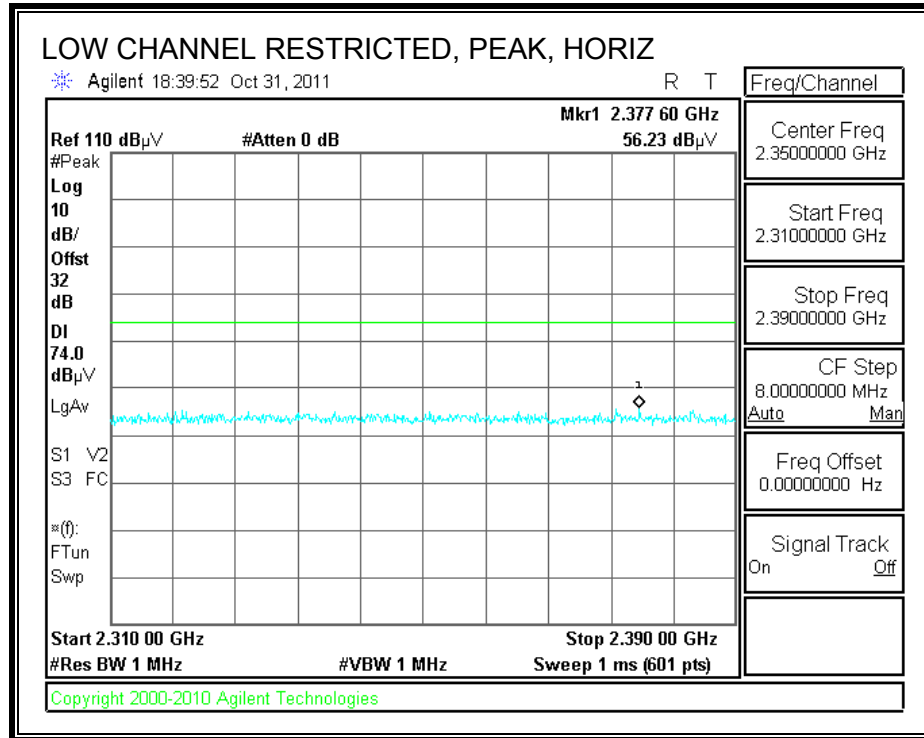


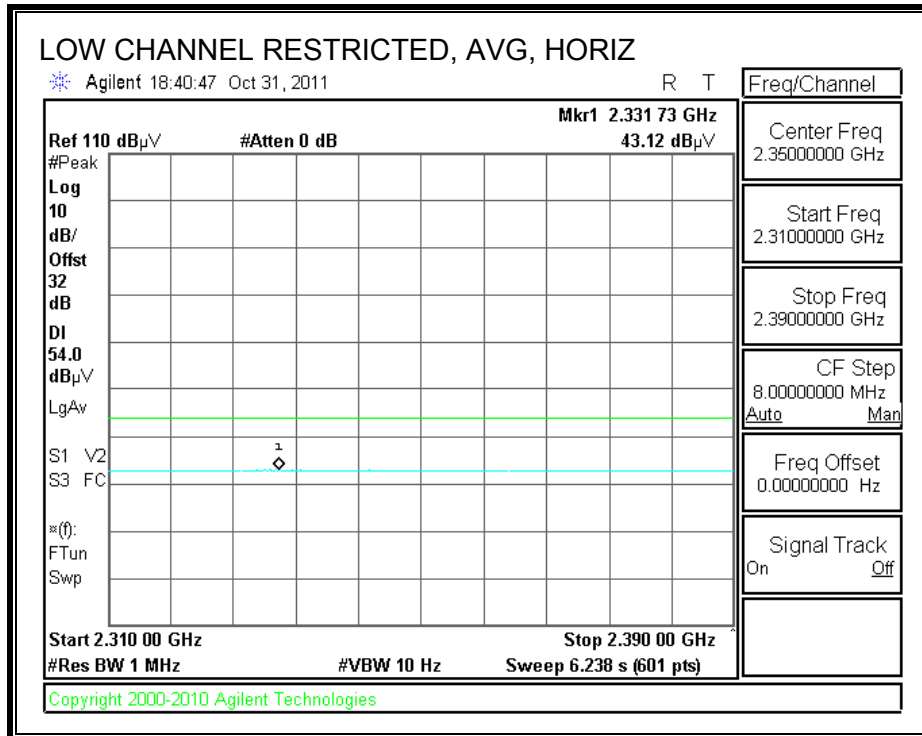
**HARMONICS AND SPURIOUS EMISSIONS**

High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Oliver Su											
Date:		11/01/11											
Project #:		11U14124											
Company:		LG											
Test Target:		FCC 15.209											
Mode Oper:		EUT+AC-DC Adapter + Earphone; BT, GFSK Mode											
f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit									
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit									
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit									
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit									
CL	Cable Loss	HPF	High Pass Filter										
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
<b>Low Ch, 2402MHz</b>													
4.804	3.0	37.3	33.1	5.8	-34.8	0.0	0.0	41.4	74.0	-32.6	H	P	
4.804	3.0	25.1	33.1	5.8	-34.8	0.0	0.0	29.1	54.0	-24.9	H	A	
12.010	3.0	33.8	39.4	9.7	-32.5	0.0	0.0	50.5	74.0	-23.5	H	P	
12.010	3.0	20.9	39.4	9.7	-32.5	0.0	0.0	37.5	54.0	-16.5	H	A	
4.804	3.0	39.4	33.1	5.8	-34.8	0.0	0.0	43.4	74.0	-30.6	V	P	
4.804	3.0	28.5	33.1	5.8	-34.8	0.0	0.0	32.5	54.0	-21.5	V	A	
12.010	3.0	33.5	39.4	9.7	-32.5	0.0	0.0	50.1	74.0	-23.9	V	P	
12.010	3.0	20.9	39.4	9.7	-32.5	0.0	0.0	37.5	54.0	-16.5	V	A	
<b>Mid Ch, 2441MHz</b>													
4.882	3.0	36.2	33.2	5.8	-34.8	0.0	0.0	40.4	74.0	-33.6	H	P	
4.882	3.0	23.9	33.2	5.8	-34.8	0.0	0.0	28.1	54.0	-25.9	H	A	
7.323	3.0	35.3	36.3	7.3	-34.1	0.0	0.0	44.8	74.0	-29.2	H	P	
7.323	3.0	22.9	36.3	7.3	-34.1	0.0	0.0	32.4	54.0	-21.6	H	A	
12.205	3.0	33.2	39.4	9.8	-32.5	0.0	0.0	49.9	74.0	-24.1	H	P	
12.205	3.0	21.1	39.4	9.8	-32.5	0.0	0.0	37.8	54.0	-16.2	H	A	
4.882	3.0	37.4	33.2	5.8	-34.8	0.0	0.0	41.6	74.0	-32.4	V	P	
4.882	3.0	24.0	33.2	5.8	-34.8	0.0	0.0	28.2	54.0	-25.8	V	A	
7.323	3.0	35.2	36.3	7.3	-34.1	0.0	0.0	44.7	74.0	-29.3	V	P	
7.323	3.0	23.0	36.3	7.3	-34.1	0.0	0.0	32.5	54.0	-21.5	V	A	
12.205	3.0	33.8	39.4	9.8	-32.5	0.0	0.0	50.5	74.0	-23.5	V	P	
12.205	3.0	21.1	39.4	9.8	-32.5	0.0	0.0	37.9	54.0	-16.1	V	A	
<b>High Ch, 2480MHz</b>													
4.960	3.0	36.4	33.2	5.9	-34.8	0.0	0.0	40.7	74.0	-33.3	H	P	
4.960	3.0	23.9	33.2	5.9	-34.8	0.0	0.0	28.2	54.0	-25.8	H	A	
7.440	3.0	34.9	36.5	7.3	-34.1	0.0	0.0	44.6	74.0	-29.4	H	P	
7.440	3.0	22.9	36.5	7.3	-34.1	0.0	0.0	32.7	54.0	-21.3	H	A	
12.400	3.0	32.8	39.4	9.9	-32.5	0.0	0.0	49.7	74.0	-24.3	H	P	
12.400	3.0	20.7	39.4	9.9	-32.5	0.0	0.0	37.6	54.0	-16.4	H	A	
4.960	3.0	36.2	33.2	5.9	-34.8	0.0	0.0	40.5	74.0	-33.5	V	P	
4.960	3.0	23.8	33.2	5.9	-34.8	0.0	0.0	28.1	54.0	-25.9	V	A	
7.440	3.0	35.6	36.5	7.3	-34.1	0.0	0.0	45.3	74.0	-28.7	V	P	
7.440	3.0	22.8	36.5	7.3	-34.1	0.0	0.0	32.6	54.0	-21.4	V	A	
12.400	3.0	32.8	39.4	9.9	-32.5	0.0	0.0	49.7	74.0	-24.3	V	P	
12.400	3.0	20.8	39.4	9.9	-32.5	0.0	0.0	37.6	54.0	-16.4	V	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

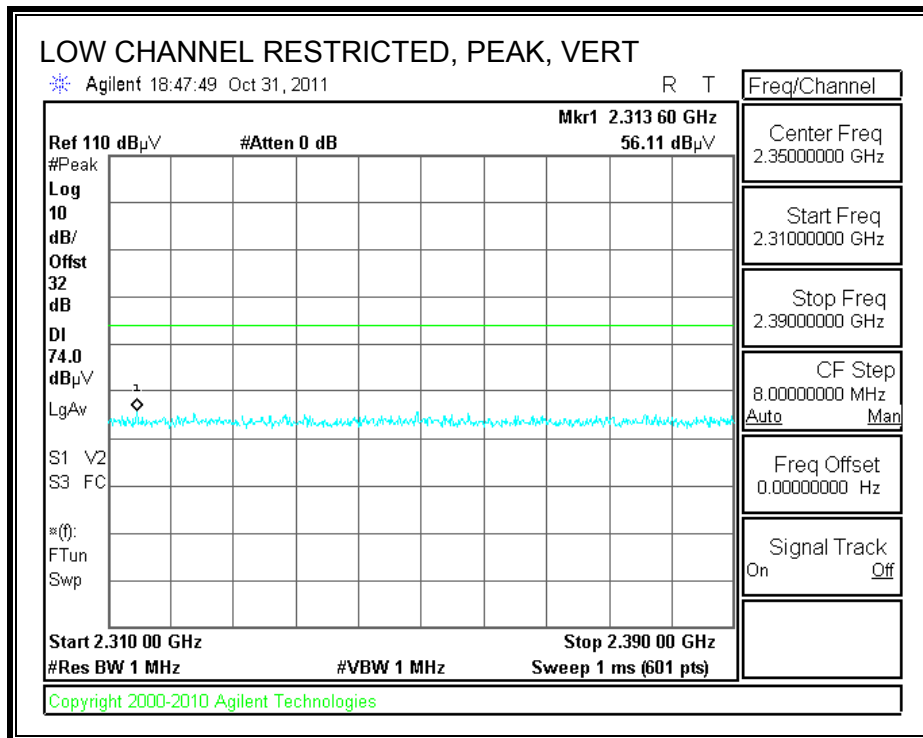
### 8.2.1. ENHANCED DATA RATE 8PSK MODULATION

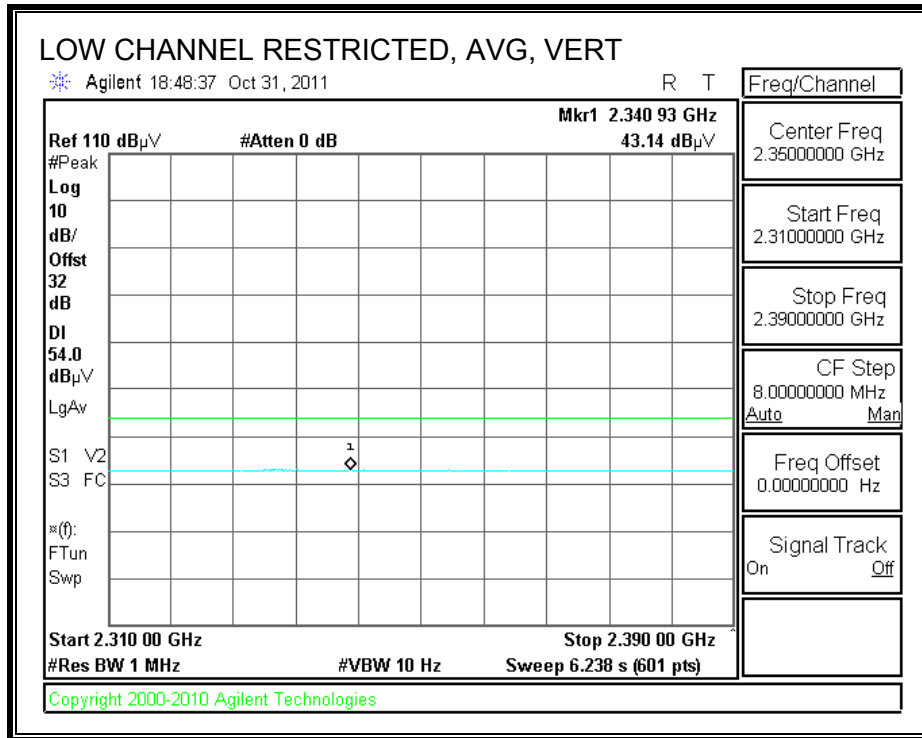
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





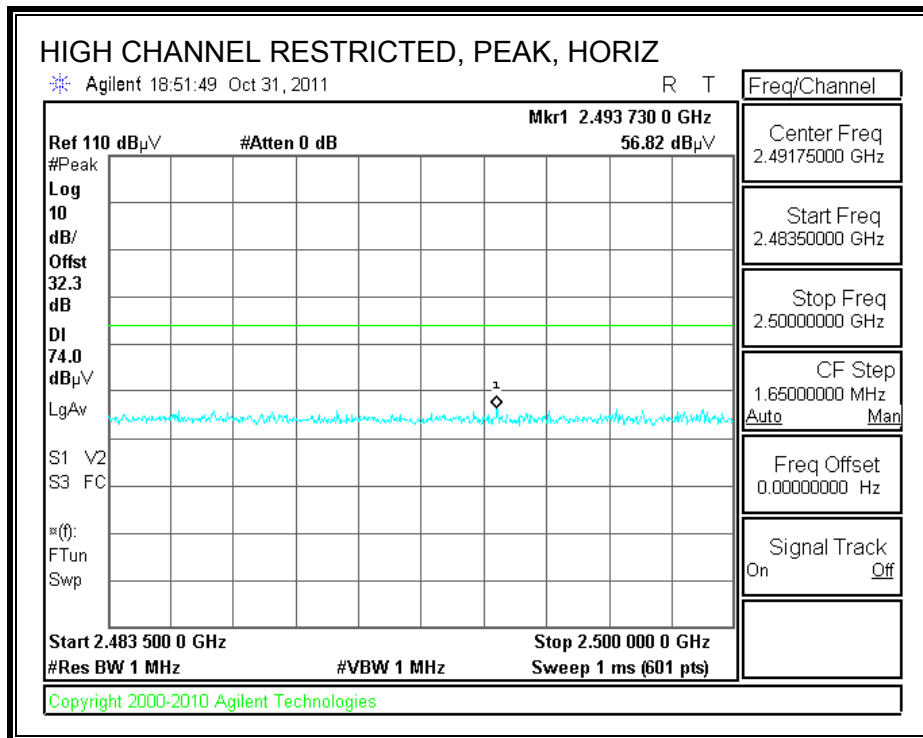
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

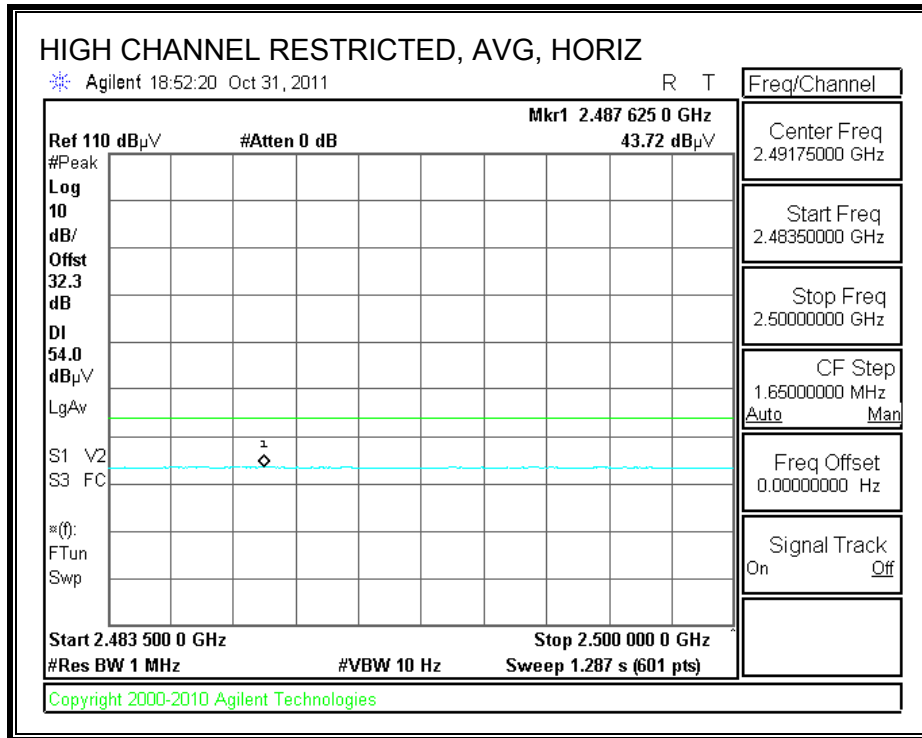




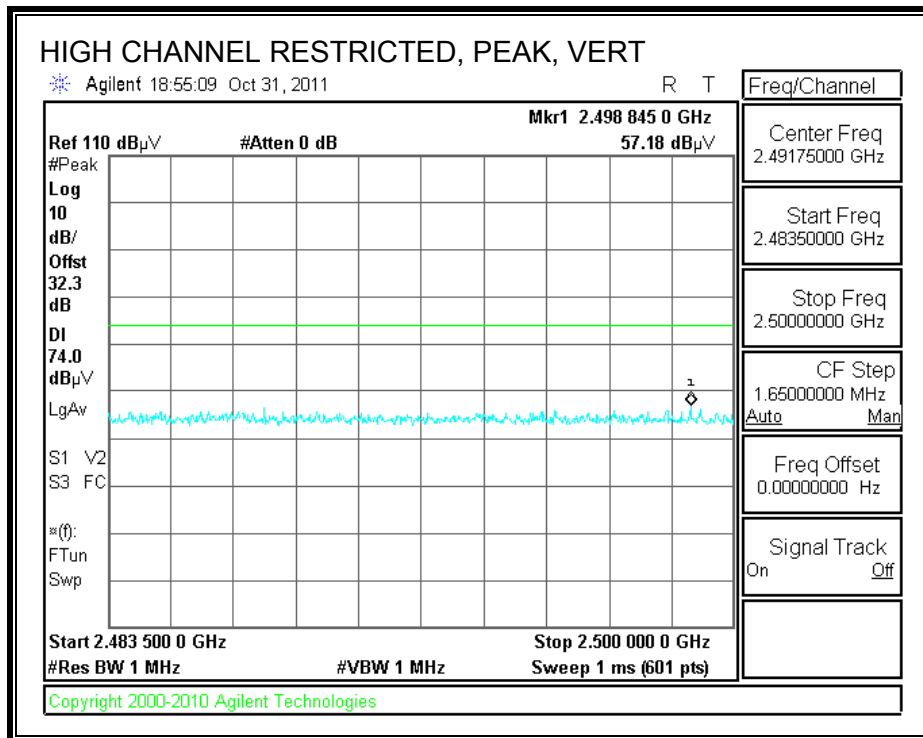


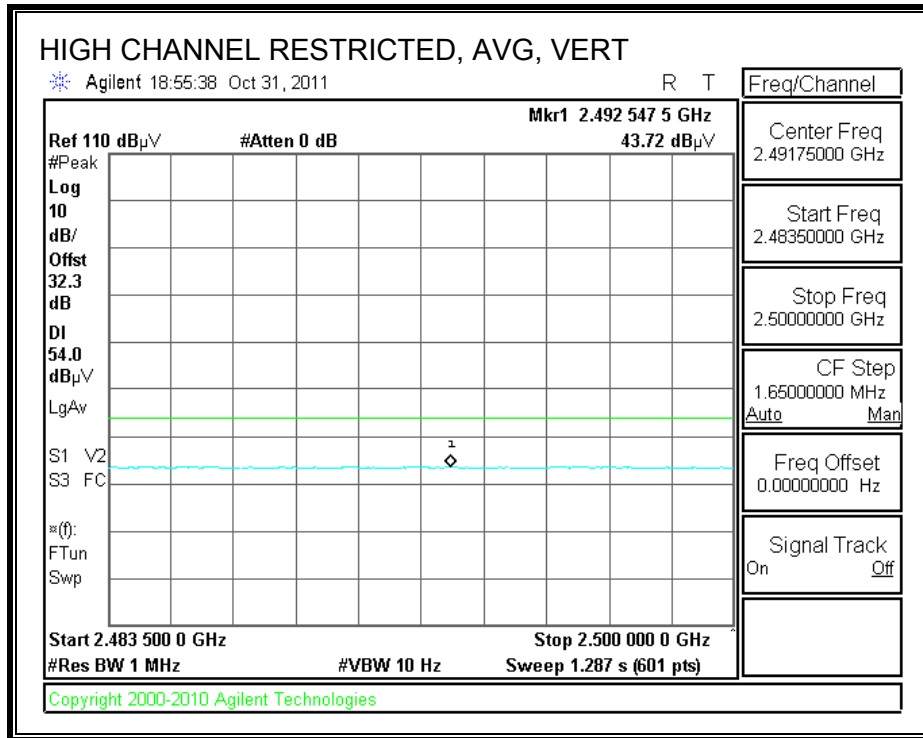
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



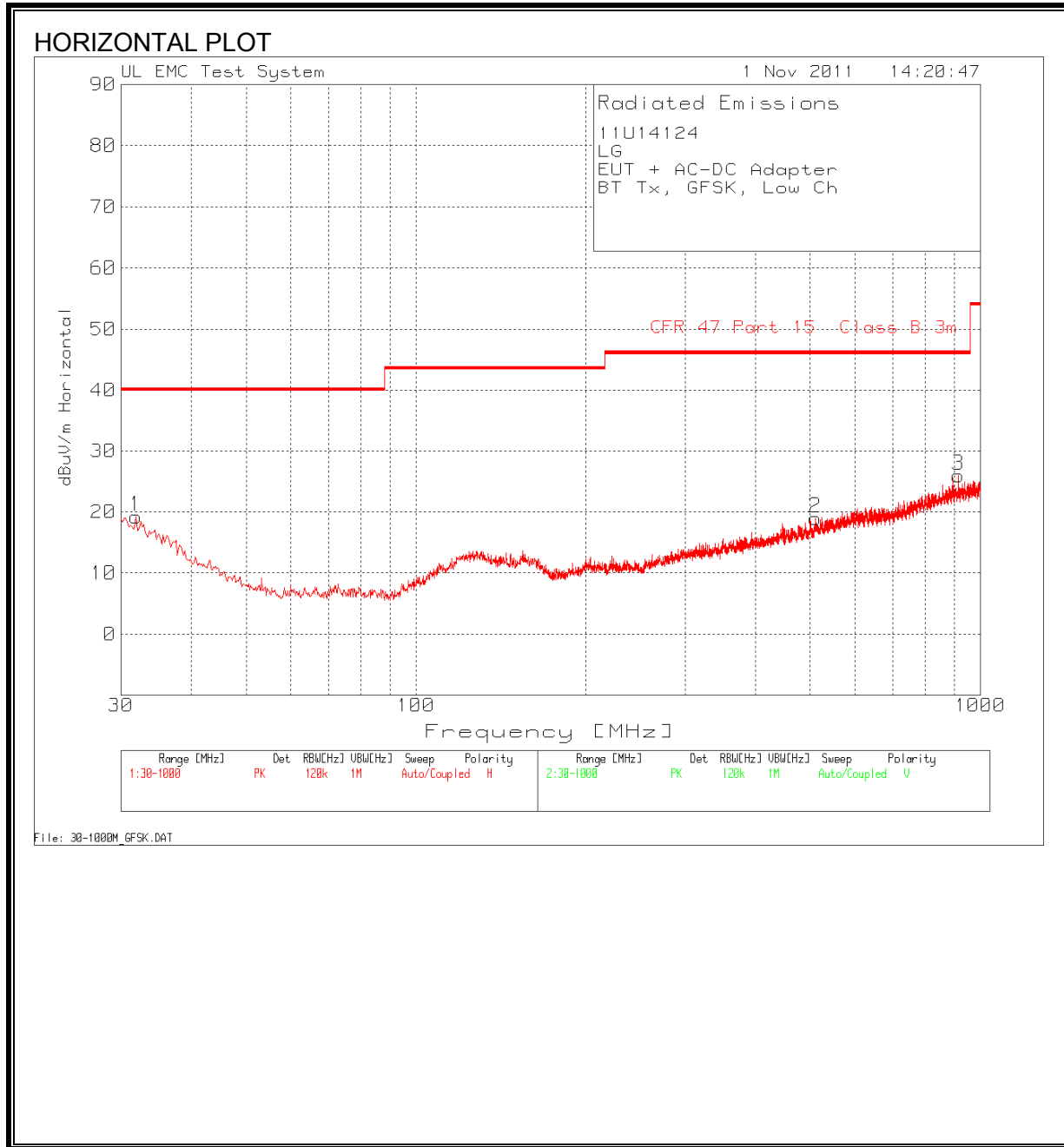


**HARMONICS AND SPURIOUS EMISSIONS**

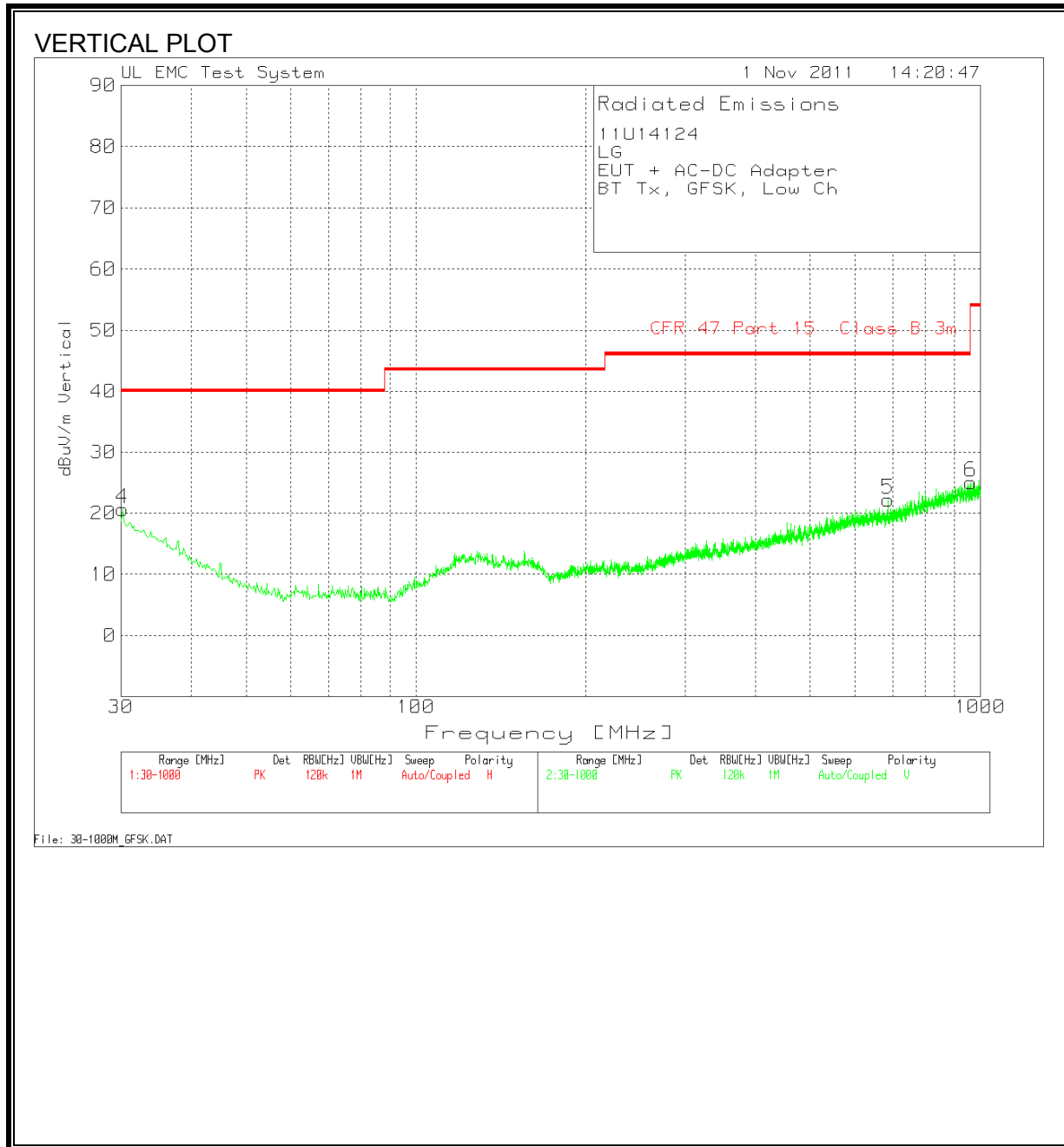
High Frequency Measurement													
Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		Oliver Su											
Date:		10/31/11											
Project #:		11U14124											
Company:		LG											
Test Target:		FCC 15.209											
Mode Oper:		EUT+AC-DC Adapter + Earphone; BT, 8PSK Mode											
f	Measurement Frequency	Amp	Preamp Gain	Average Field Strength Limit									
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Peak Field Strength Limit									
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Margin vs. Average Limit									
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Margin vs. Peak Limit									
CL	Cable Loss	HPF	High Pass Filter										
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Low Ch, 2402MHz													
4.804	3.0	37.6	33.1	5.8	-34.8	0.0	0.0	41.7	74.0	-32.3	V	P	
4.804	3.0	25.4	33.1	5.8	-34.8	0.0	0.0	29.4	54.0	-24.6	V	A	
12.010	3.0	33.4	39.4	9.7	-32.5	0.0	0.0	50.0	74.0	-24.0	V	P	
12.010	3.0	20.9	39.4	9.7	-32.5	0.0	0.0	37.5	54.0	-16.5	V	A	
4.804	3.0	36.9	33.1	5.8	-34.8	0.0	0.0	41.0	74.0	-33.0	H	P	
4.804	3.0	24.3	33.1	5.8	-34.8	0.0	0.0	28.4	54.0	-25.6	H	A	
12.010	3.0	33.0	39.4	9.7	-32.5	0.0	0.0	49.6	74.0	-24.4	H	P	
12.010	3.0	20.9	39.4	9.7	-32.5	0.0	0.0	37.5	54.0	-16.5	H	A	
Mid Ch, 2441MHz													
4.882	3.0	36.6	33.2	5.8	-34.8	0.0	0.0	40.8	74.0	-33.2	H	P	
4.882	3.0	24.3	33.2	5.8	-34.8	0.0	0.0	28.4	54.0	-25.6	H	A	
7.323	3.0	35.0	36.3	7.3	-34.1	0.0	0.0	44.5	74.0	-29.5	H	P	
7.323	3.0	23.0	36.3	7.3	-34.1	0.0	0.0	32.5	54.0	-21.5	H	A	
12.205	3.0	33.4	39.4	9.8	-32.5	0.0	0.0	50.2	74.0	-23.8	H	P	
12.205	3.0	21.1	39.4	9.8	-32.5	0.0	0.0	37.9	54.0	-16.1	H	A	
4.882	3.0	36.9	33.2	5.8	-34.8	0.0	0.0	41.1	74.0	-32.9	V	P	
4.882	3.0	24.2	33.2	5.8	-34.8	0.0	0.0	28.4	54.0	-25.6	V	A	
7.323	3.0	35.9	36.3	7.3	-34.1	0.0	0.0	45.4	74.0	-28.6	V	P	
7.323	3.0	22.9	36.3	7.3	-34.1	0.0	0.0	32.4	54.0	-21.6	V	A	
12.205	3.0	33.6	39.4	9.8	-32.5	0.0	0.0	50.3	74.0	-23.7	V	P	
12.205	3.0	21.1	39.4	9.8	-32.5	0.0	0.0	37.9	54.0	-16.1	V	A	
High Ch, 2480MHz													
4.960	3.0	35.7	33.2	5.9	-34.8	0.0	0.0	40.0	74.0	-34.0	H	P	
4.960	3.0	23.8	33.2	5.9	-34.8	0.0	0.0	28.1	54.0	-25.9	H	A	
7.440	3.0	35.4	36.5	7.3	-34.1	0.0	0.0	45.2	74.0	-28.8	H	P	
7.440	3.0	22.9	36.5	7.3	-34.1	0.0	0.0	32.6	54.0	-21.4	H	A	
12.400	3.0	32.9	39.4	9.9	-32.5	0.0	0.0	49.7	74.0	-24.3	H	P	
12.400	3.0	20.7	39.4	9.9	-32.5	0.0	0.0	37.6	54.0	-16.4	H	A	
4.960	3.0	35.8	33.2	5.9	-34.8	0.0	0.0	40.1	74.0	-33.9	V	P	
4.960	3.0	24.1	33.2	5.9	-34.8	0.0	0.0	28.5	54.0	-25.5	V	A	
7.440	3.0	35.7	36.5	7.3	-34.1	0.0	0.0	45.5	74.0	-28.5	V	P	
7.440	3.0	22.9	36.5	7.3	-34.1	0.0	0.0	32.6	54.0	-21.4	V	A	
12.400	3.0	32.7	39.4	9.9	-32.5	0.0	0.0	49.6	74.0	-24.4	V	P	
12.400	3.0	20.7	39.4	9.9	-32.5	0.0	0.0	37.6	54.0	-16.4	V	A	
Rev. 4.1.2.7													
Note: No other emissions were detected above the system noise floor.													

### 8.3. 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)**



**HORIZONTAL AND VERTICAL DATA**

11U14124										
LG										
EUT + AC-DC Adapter										
BT Tx, GFSK, Low Ch										
Horizontal 30-1000MHz										
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
31.9384	27.93	PK	0.6	-28.3	19	19.23	40	-20.77	176	Horz
510.1539	28.22	PK	2.3	-28.5	17	19.02	46	-26.98	251	Horz
914.3205	28.15	PK	3.2	-27.6	22.2	25.95	46	-20.05	99	Horz
Vertical 30-1000MHz										
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
30.1938	28.49	PK	0.6	-28.3	19.9	20.69	40	-19.31	176	Vert
687.1343	28.94	PK	2.7	-28.4	18.9	22.14	46	-23.86	101	Vert
962.0064	26.85	PK	3.2	-27.5	22.5	25.05	54	-28.95	176	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: 30-1000M_11U14124LG.TXT										
File: 30-1000M_GFSK.DAT										



## 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

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.

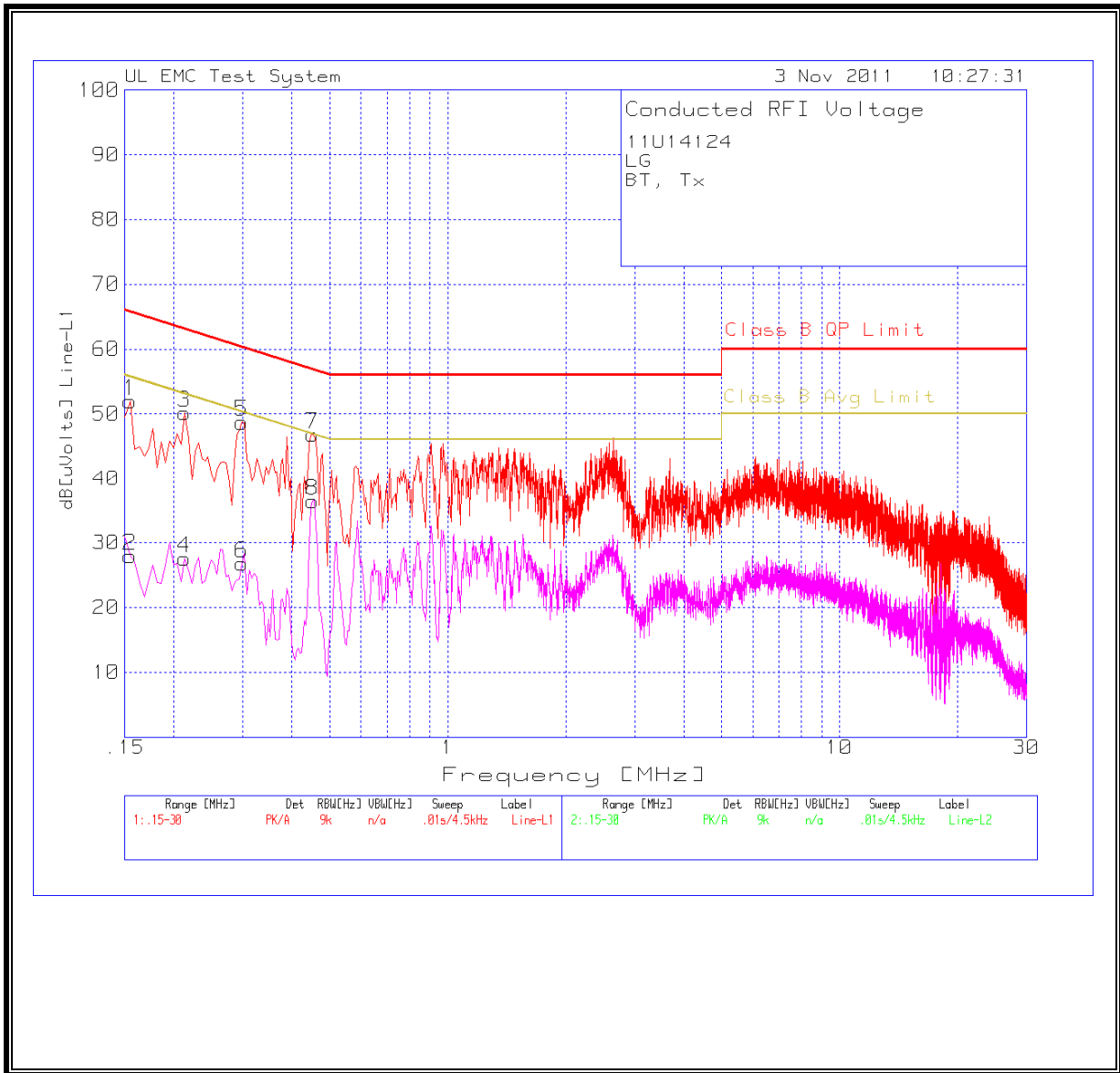
Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

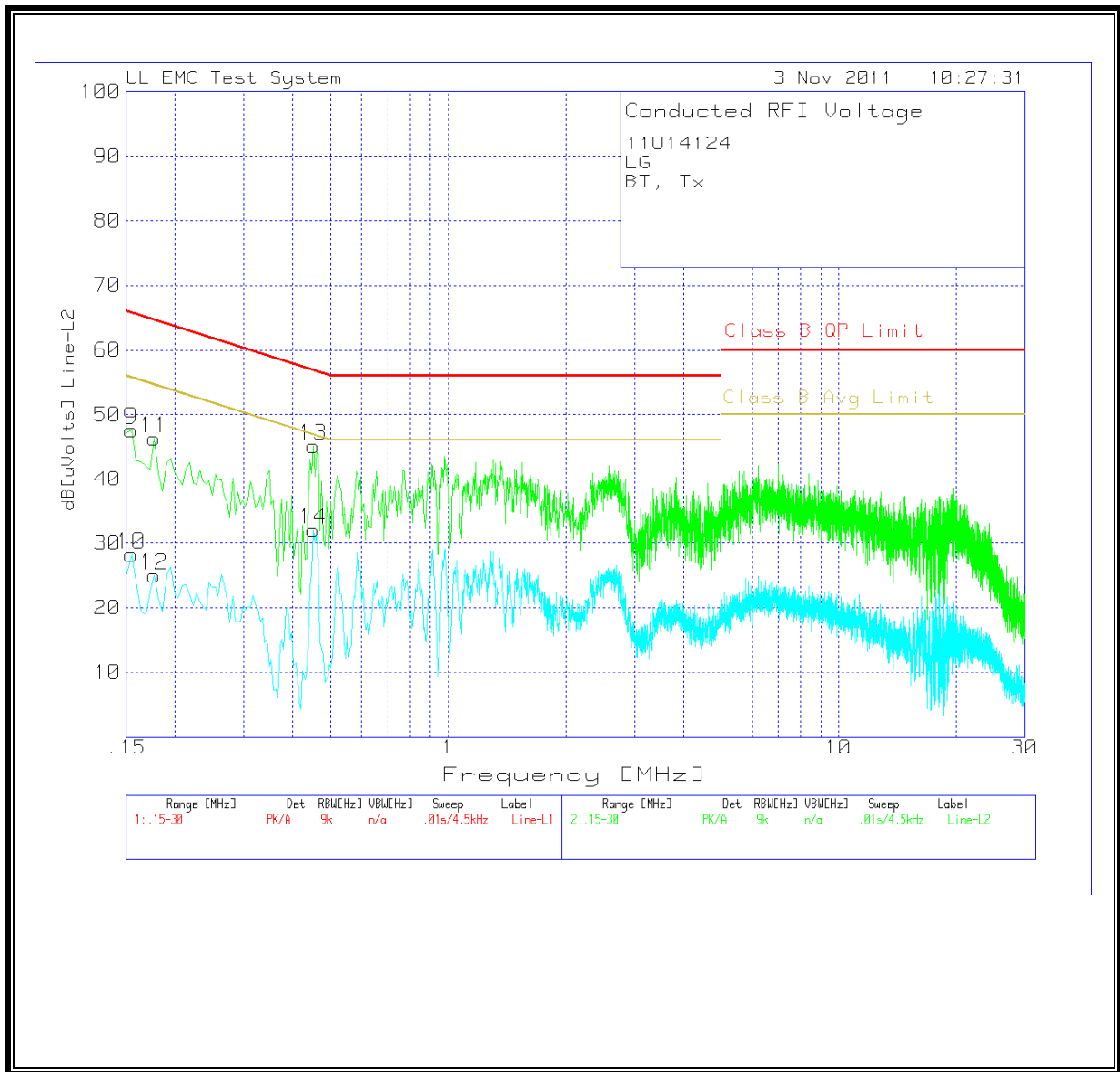
**6 WORST EMISSIONS**

11U14124									
LG									
BT, Tx									
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
0.1545	51.94	PK	0	0	51.94	65.8	-13.86	55.8	-
0.1545	27.92	Av	0	0	27.92	65.8	-37.88	55.8	-27.88
0.213	50.13	PK	0	0	50.13	63.1	-12.97	53.1	-
0.213	27.59	Av	0	0	27.59	63.1	-35.51	53.1	-25.51
0.2985	48.7	PK	0	0	48.7	60.3	-11.6	50.3	-
0.2985	26.8	Av	0	0	26.8	60.3	-33.5	50.3	-23.5
0.4515	46.85	PK	0	0	46.85	56.8	-9.95	46.8	-
0.4515	36.45	Av	0	0	36.45	56.8	-20.35	46.8	-10.35
Line-L2 .15 30MHz									
0.1545	47.66	PK	0	0	47.66	65.8	-18.14	55.8	-
0.1545	28.22	Av	0	0	28.22	65.8	-37.58	55.8	-27.58
0.177	46.3	PK	0	0	46.3	64.6	-18.3	54.6	-
0.177	25.03	Av	0	0	25.03	64.6	-39.57	54.6	-29.57
0.4515	45.12	PK	0	0	45.12	56.8	-11.68	46.8	-
0.4515	32.06	Av	0	0	32.06	56.8	-24.74	46.8	-14.74
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: LC Line-L1.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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	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 <sup>2</sup> )	Averaging time (minutes)
30–300 .....	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

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

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

**IC RULES**

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

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

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	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> <sup>0.5</sup>	0.0042 <i>f</i> <sup>0.5</sup>	<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> <sup>1.2</sup>
150 000–300 000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616 000 / <i>f</i> <sup>1.2</sup>

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

- Notes:**
1. Frequency, *f*, is in MHz.
  2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.
  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/m<sup>2</sup>  
EIRP = Equivalent Isotropic Radiated Power in W  
D = Separation distance in m

Power density in units of W/m<sup>2</sup> is converted to units of mW/cm<sup>2</sup> 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/m<sup>2</sup>

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

$$\text{Total EIRP} = (P1 * G1) + (P2 * G2) + \dots + (Pn * Gn)$$

where

P<sub>x</sub> = Power of transmitter x  
G<sub>x</sub> = Numeric gain of antenna x

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

## **LIMITS**

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

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

**RESULTS**

(MPE distance equals 20 cm)

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m <sup>2</sup> )	FCC Power Density (mW/cm <sup>2</sup> )
2.4 GHz	Bluetooth	0.20	10.73	-1.69	0.02	0.002