



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

**CERTIFICATION TEST REPORT**

**FOR**

**802.11a/g/n/ac WLAN + BLUETOOTH PCI-E CUSTOM COMBINATION CARD**

**MODEL NUMBER: BCM94360CS2**

**FCC ID: QDS-BRCM1072  
IC: 4324A-BRCM1072**

**REPORT NUMBER: 13U14796-2, Revision A**

**ISSUE DATE: MARCH 20, 2013**

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**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
--	03/18/13	Initial Issue	F. Ibrahim
A	03/20/13	Revised sections 7.1.3, 7.2.3, 7.1.4, 7.2.4, and 7.1.5	F. Ibrahim

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** BROADCOM CORPORATION  
190 MATHILDA PLACE  
SUNNYVALE, CA 94086, U.S.A.

**EUT DESCRIPTION:** 802.11a/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card

**MODEL:** BCM94360CS2

**SERIAL NUMBER:** C8Y2504007GFC31E9


**DATE TESTED:** February 20 – March 06, 2013

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

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.

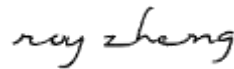
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of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

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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:

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

### 4.3. MEASUREMENT UNCERTAINTY

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

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

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/g/n/ac WLAN + Bluetooth PCI-E Custom Combination Card.

The radio module is manufactured by Broadcom.

### 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	8.34	6.82
2402 - 2480	Enhanced 8PSK	9.22	8.36

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an Amphenol/ Pulse 802.11a/b/g/n WLAN/BT antenna, with a maximum gain of 4.97 dBi for the BT antenna.

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, Ver. 5.1.0.1400  
The test utility software used during testing was Broadcom BlueTool, Ver 1.7.2

### 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 EUT was tested as an external module installed in a test jig board connected to a host Laptop PC. The EUT was oriented in a flat orientation, similar to the orientation it would have in real installations; see setup photos for details.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop PC	Dell	E6400	BDRBKK1	DoC
AC Adapter	Dell	DA90PE3	WTC0V	DoC
Adapter Board	Broadcom	BCM94331CSAD	1583414	N/A

### I/O CABLES

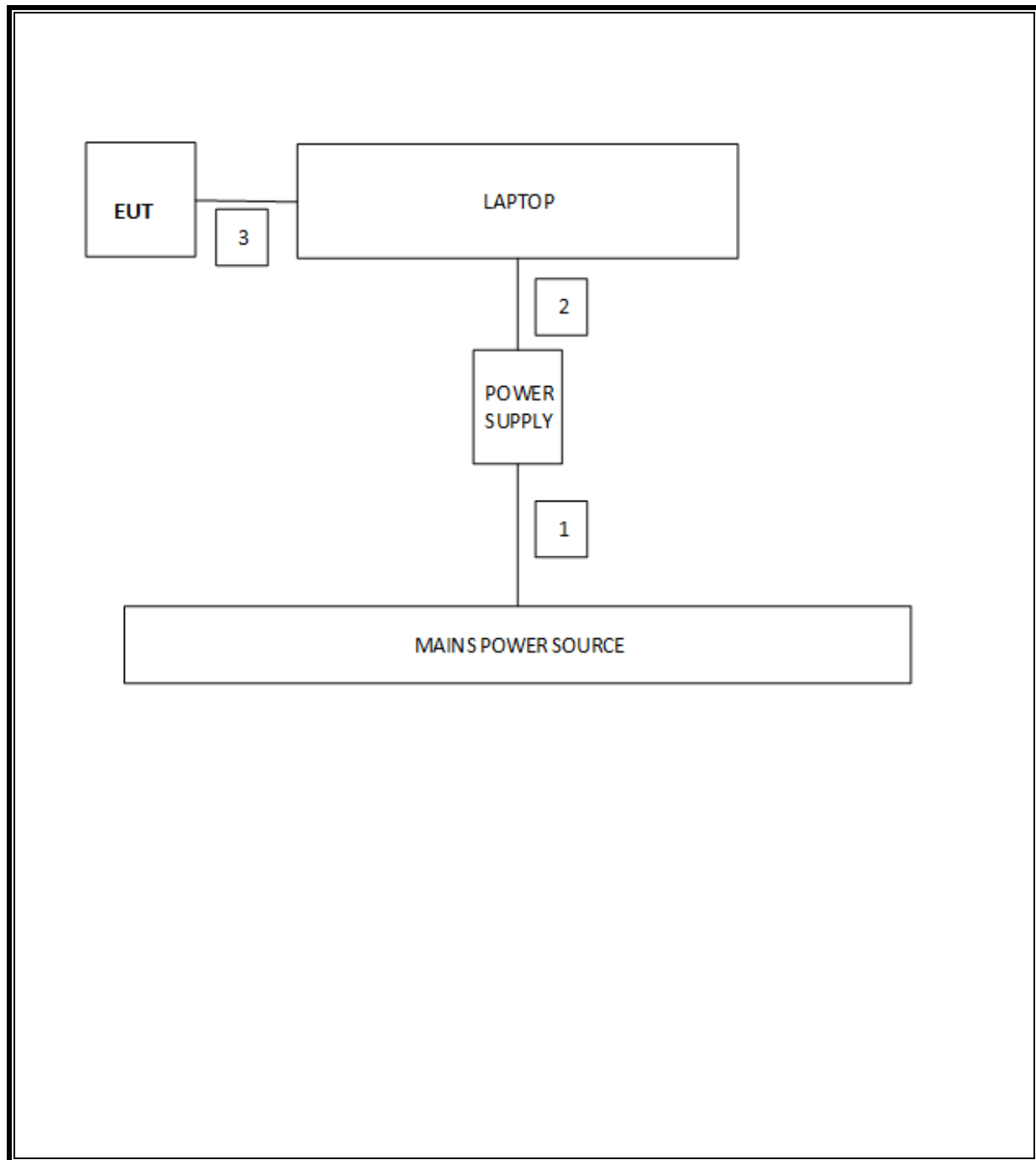
I/O Cable List						
Cable	Port	# of identical	Connector	Cable Type	Cable	Remarks
1	AC	1	US 115V	Un-Shielded	1.8	N/A
2	DC	1	DC	Shielded	1.8	N/A
3	USB	1	USB	Shielded	1.8	N/A

### TEST SETUP

The EUT is installed in a host laptop computer during the tests. Test software exercised the radio card.



**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 Date	Cal Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	12/13/11	12/13/13
Peak Power Meter	Agilent / HP	E4416A	C00963	12/13/11	12/13/13
Peak / Average Power Sensor	Agilent / HP	E9327A	C00964	12/13/11	12/13/13
Antenna, Horn, 18 GHz	EMCO	3115	C00945	11/12/12	11/12/13
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00946	11/12/12	11/12/13
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/22/12	10/22/13
LISN, 30 MHz	FCC	50/250-25-2	N02396	08/08/12	08/08/13
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	02/21/12	03/21/13
Antenna, Bilog, 30MHz-1 GHz	Sunol Sciences	JB1	C01011	03/23/12	03/23/13
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRC13192	N02683	CNR	CNR

## 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.

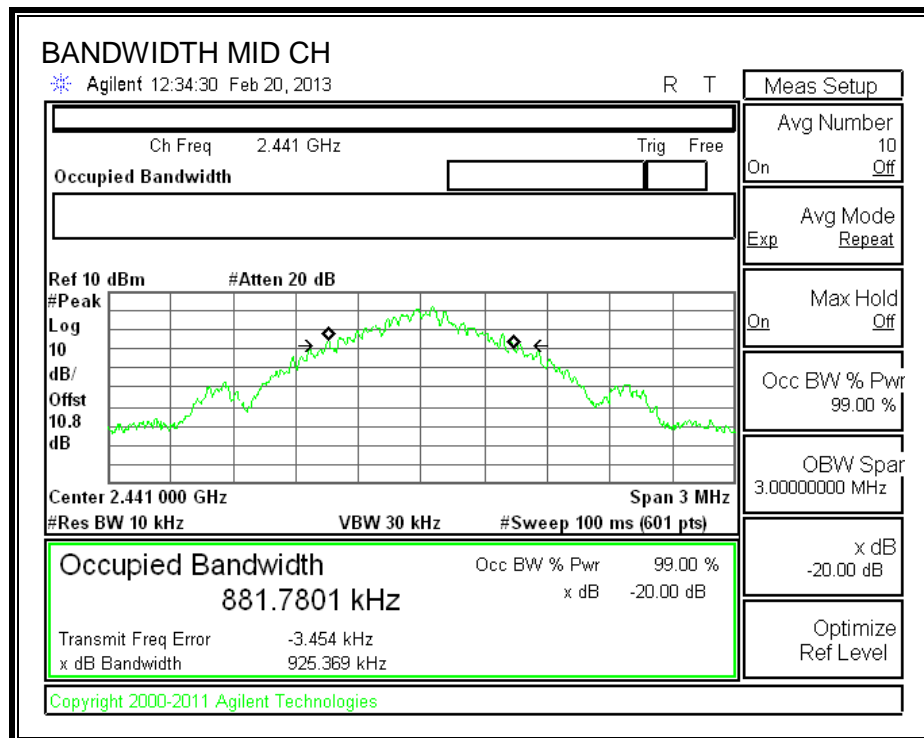
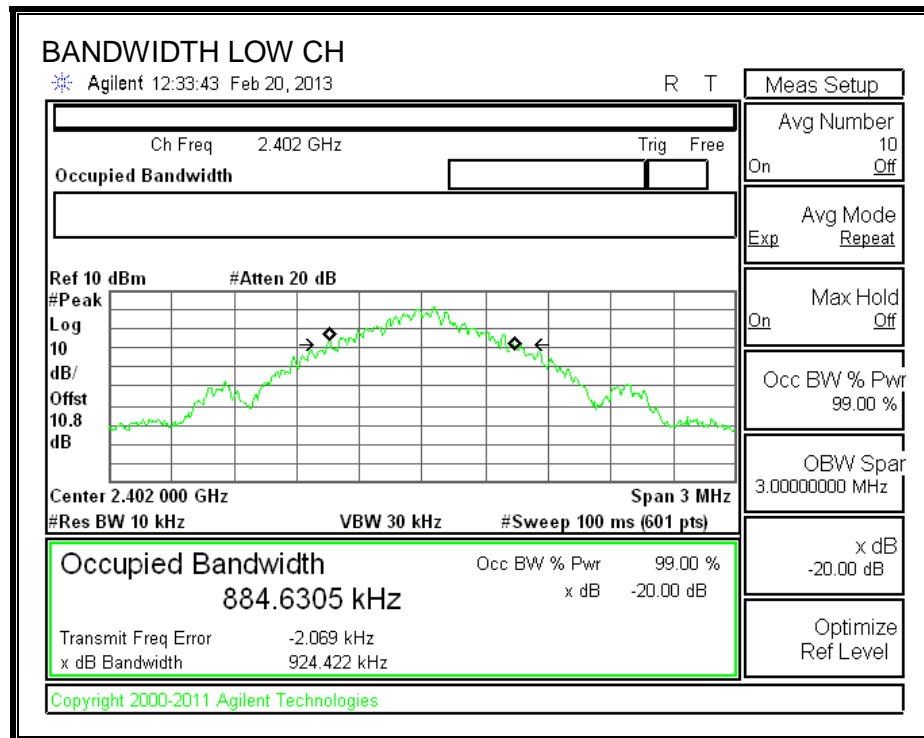
##### TEST PROCEDURE

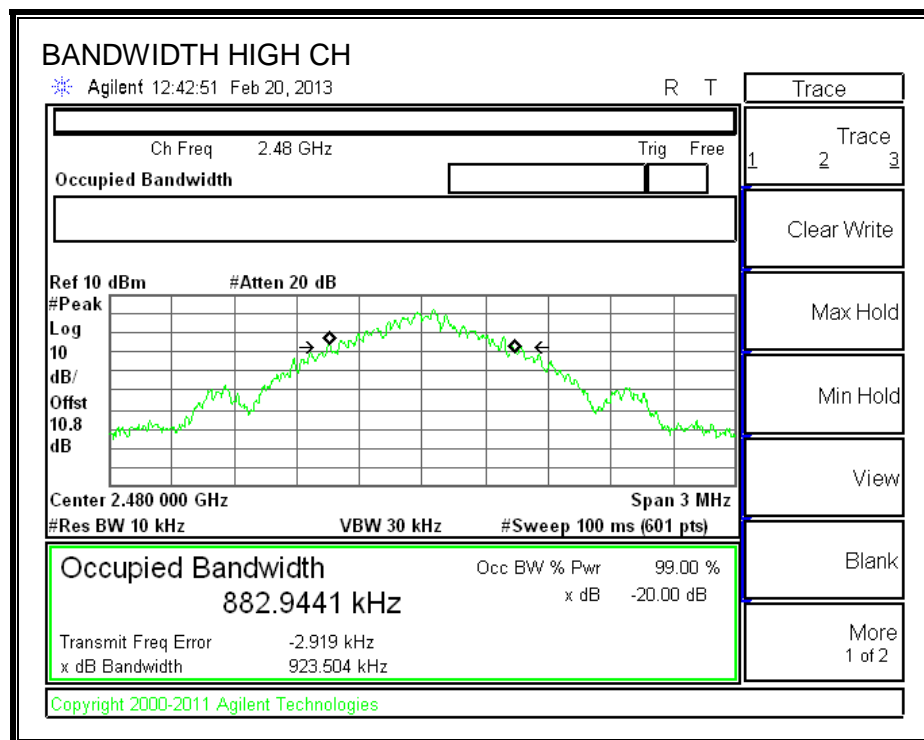
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

##### RESULTS

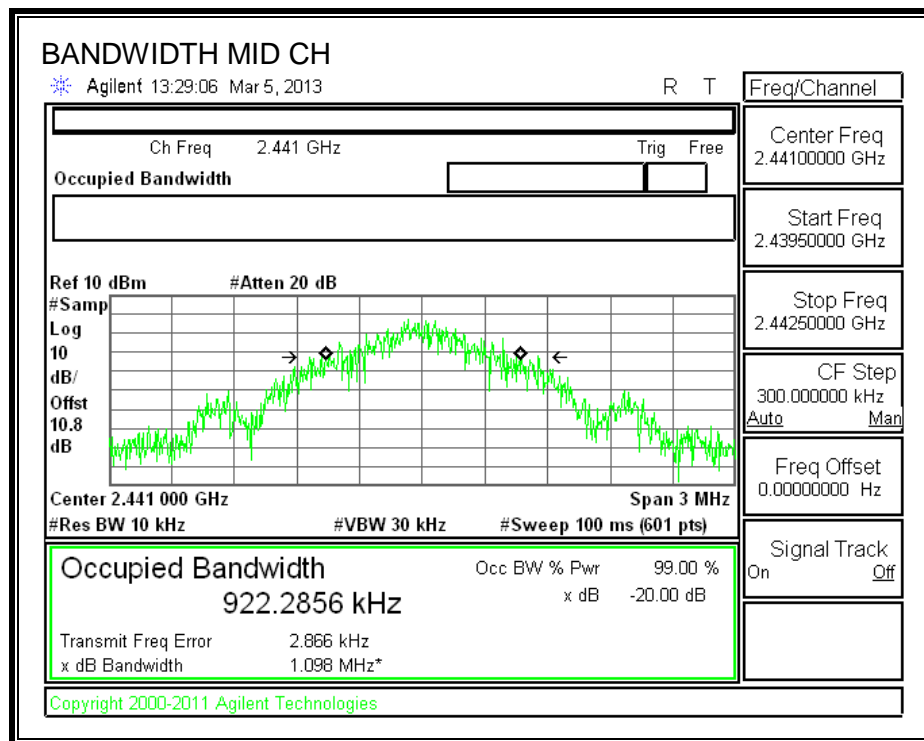
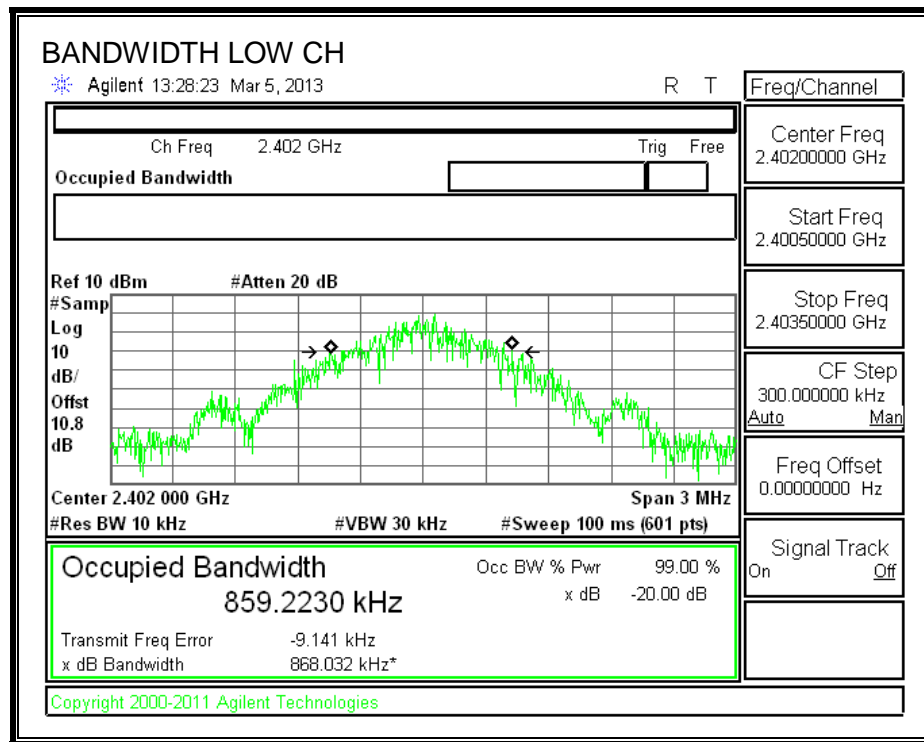
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	924.422	859.2230
Middle	2441	925.369	922.2856
High	2480	923.504	859.1657

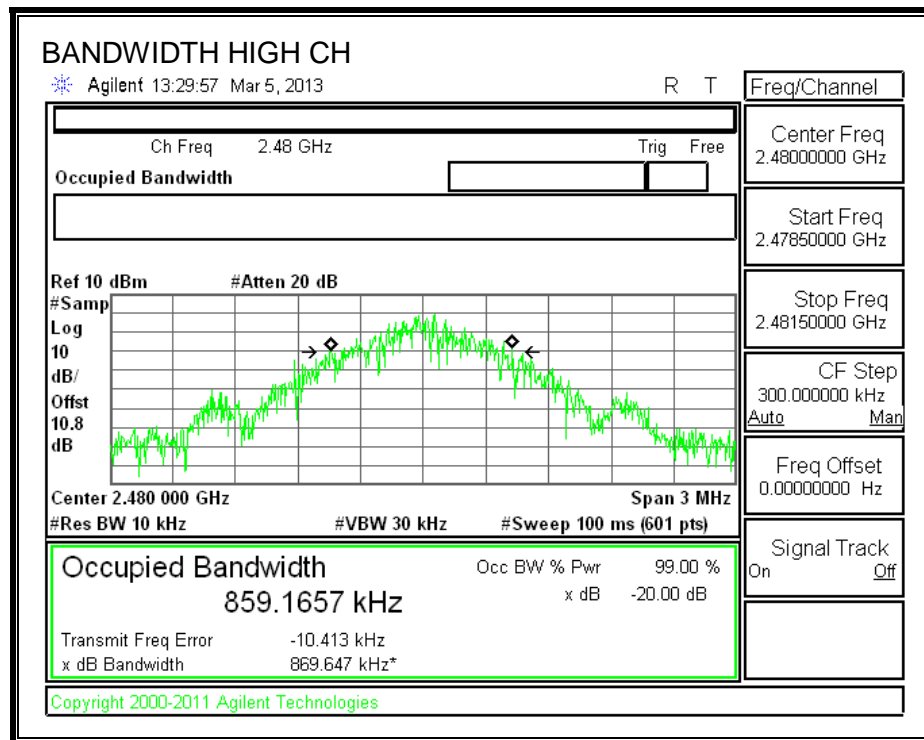
## 20 dB BANDWIDTH





## 99% 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 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.

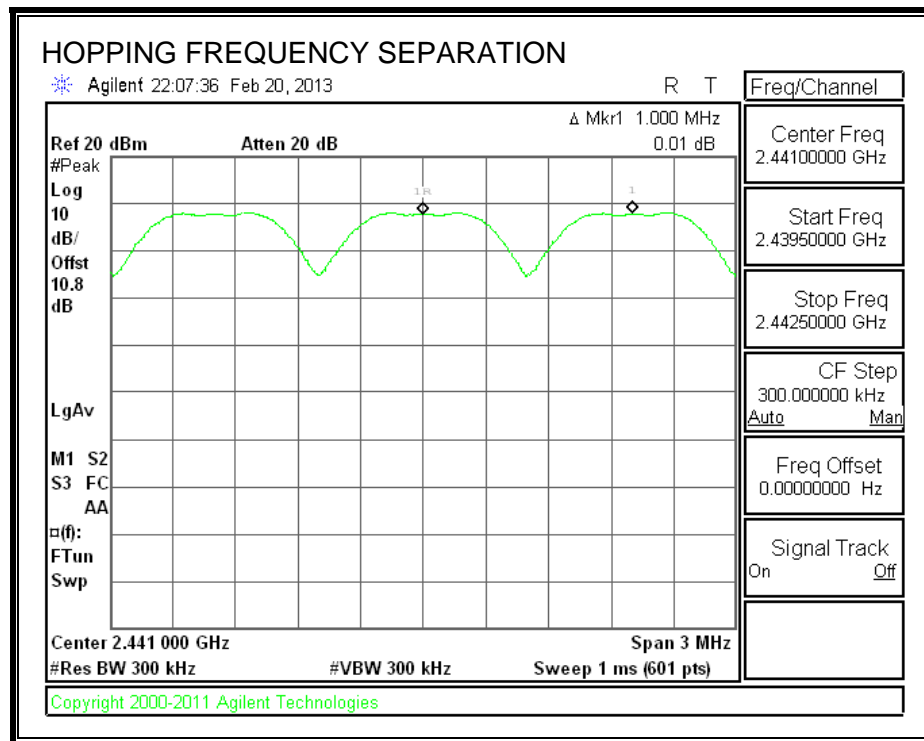
### TEST PROCEDURE

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



### **7.1.3. 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**

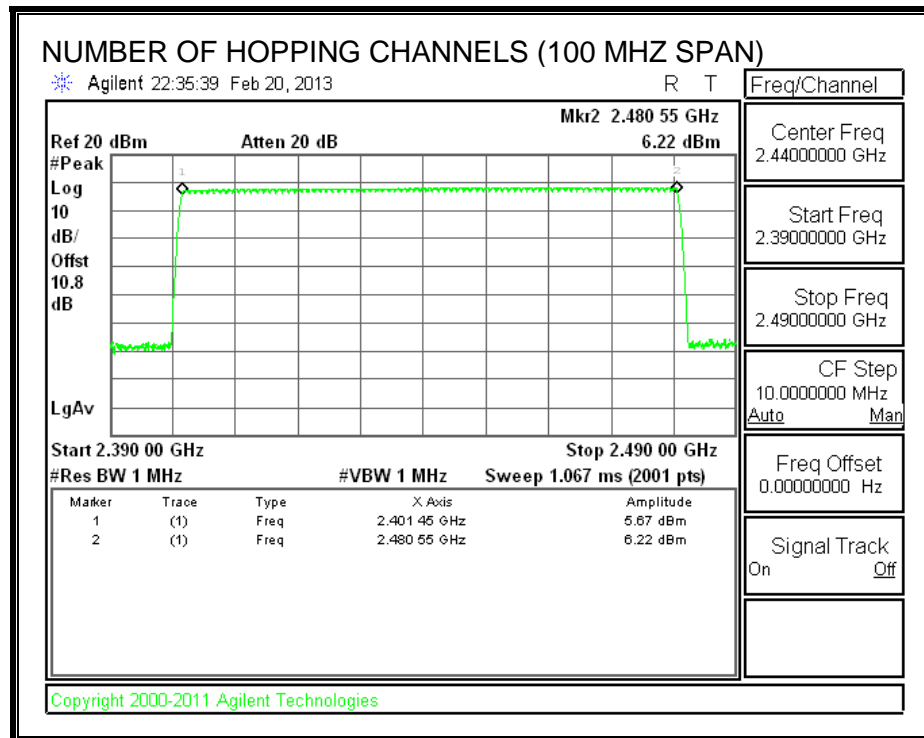
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

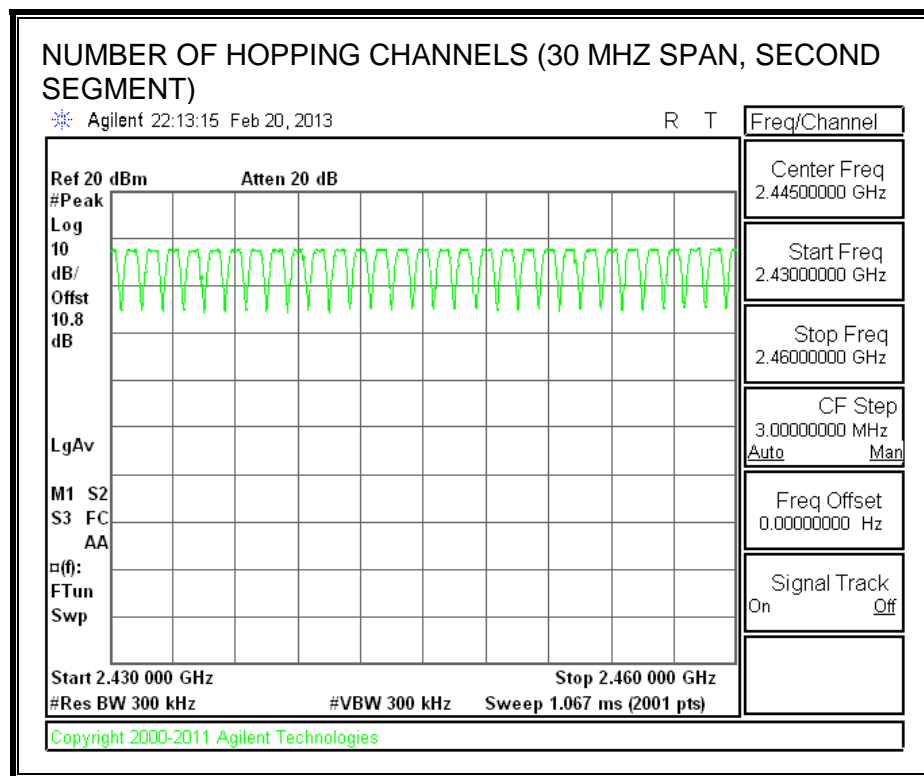
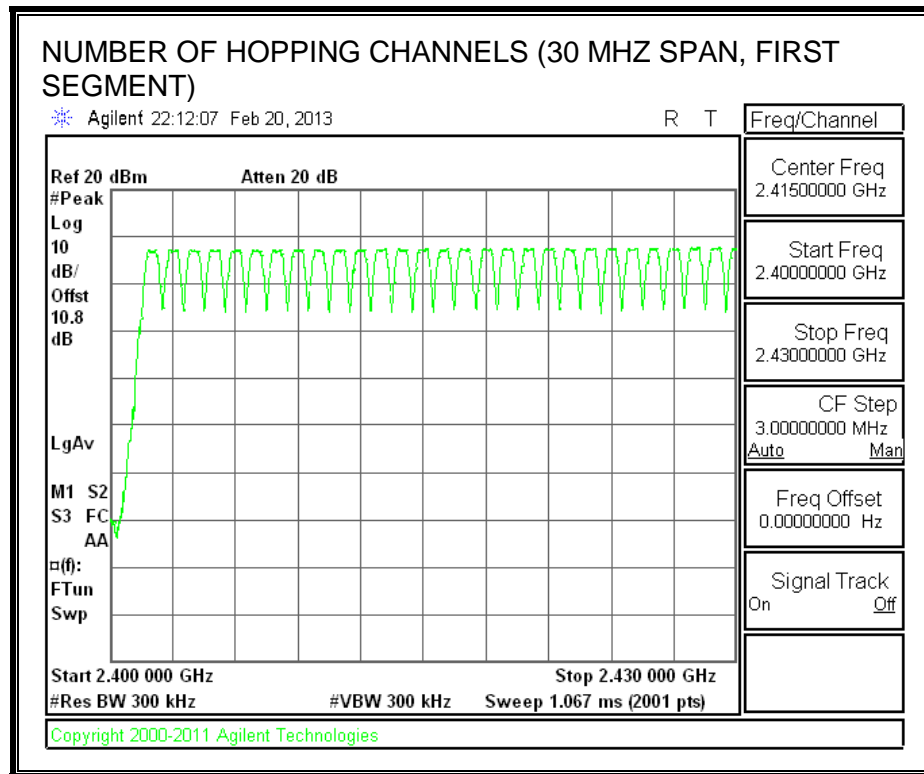
#### **RESULTS**

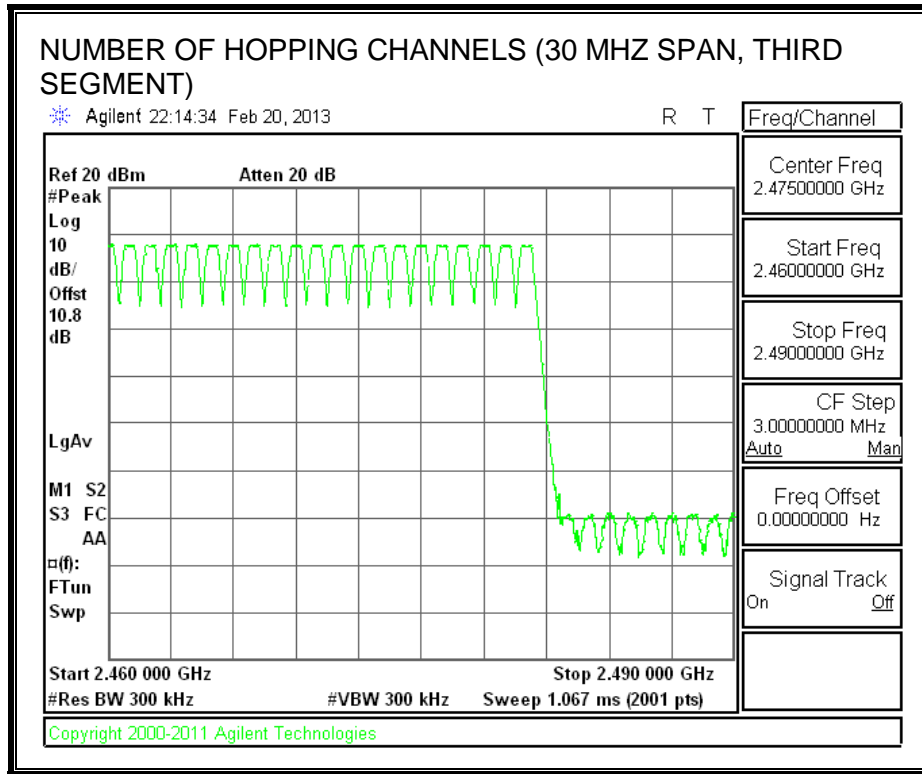
Normal Mode: 79 Channels observed.

AFH Mode: a minimum number of 20 channels declared by the client.

# **NUMBER OF HOPPING CHANNELS**







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

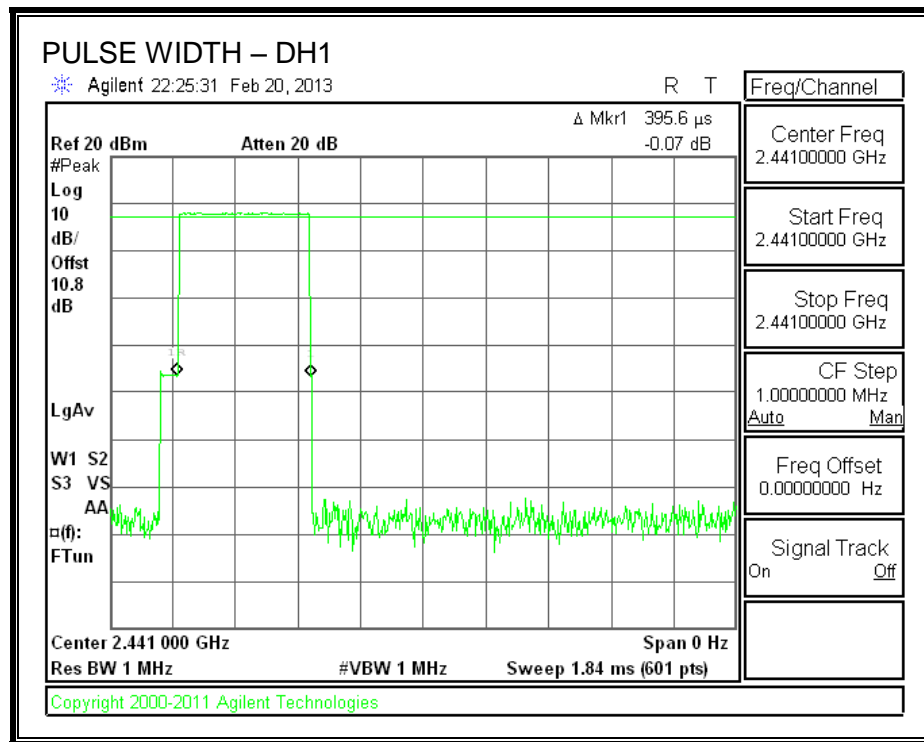
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels \* 0.4 seconds) is equal to  $10 * (\# \text{ of pulses in } 0.8 \text{ s}) * \text{pulse width}$ .

## **RESULTS**

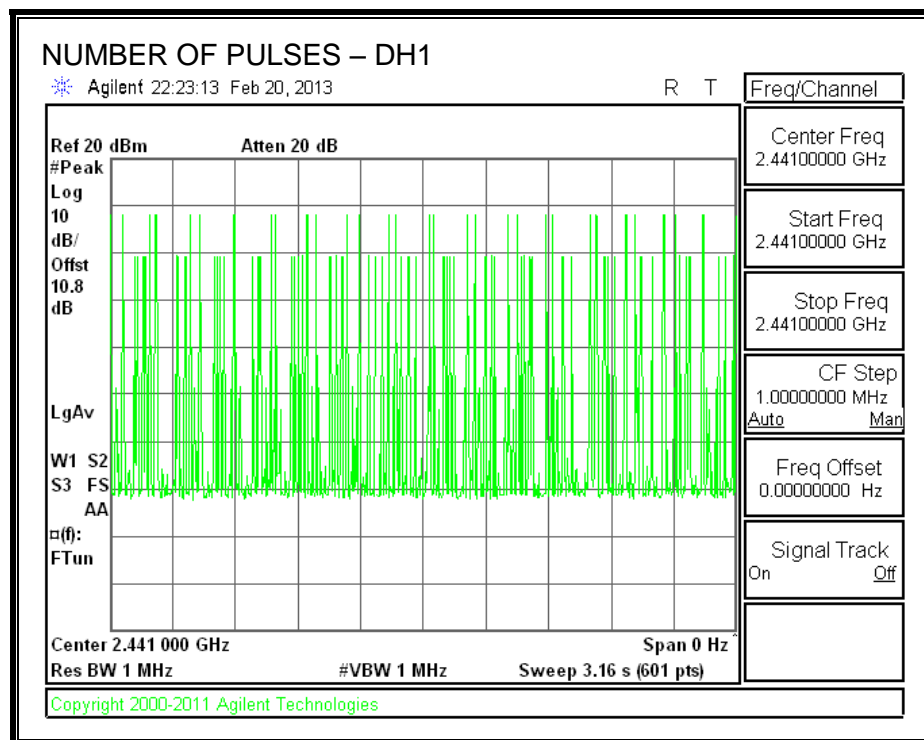
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.3956	32	0.1266	0.4	-0.2734
DH3	1.6530	16	0.2645	0.4	-0.1355
DH5	2.9520	11	0.3247	0.4	-0.0753
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.3956	64	0.2532	0.4	-0.1468
DH3	1.6530	21	0.3471	0.4	-0.0529
DH5	2.9520	13	0.3838	0.4	-0.0162

**Note:** This device supports adaptive frequency hopping (AFH) which uses the same pseudo random channel selection algorithm as is used for non AFH mode. By showing compliance with the channel dwell time requirements for 79 channels, since the dwell time requirements are based on the number of channels compliance is also demonstrated for N channels where  $20 \leq N \leq 79$ .

### PULSE WIDTH - DH1

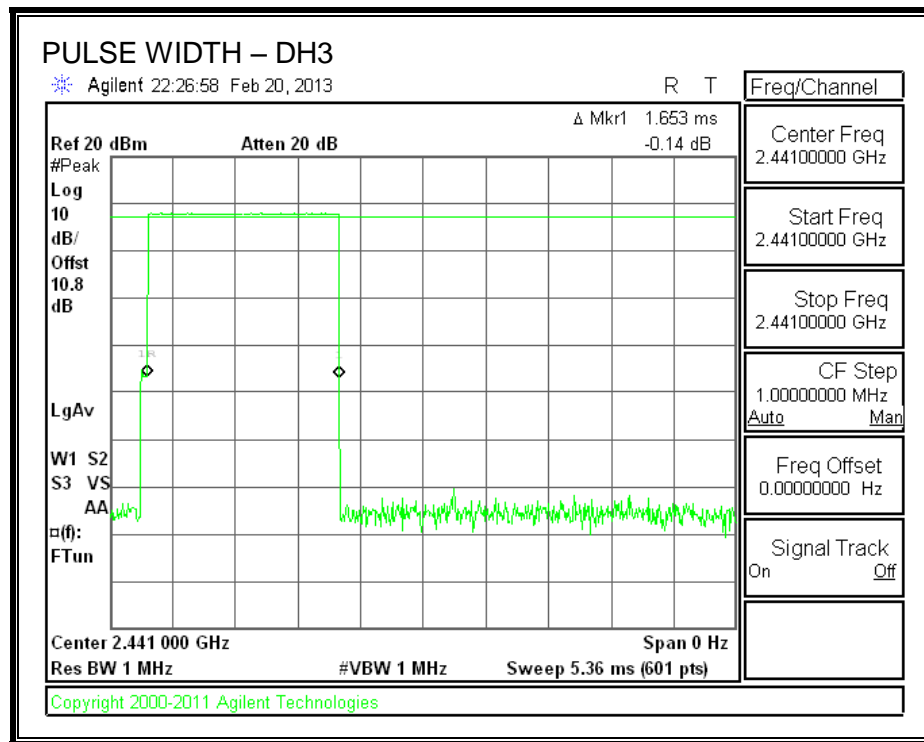


### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1

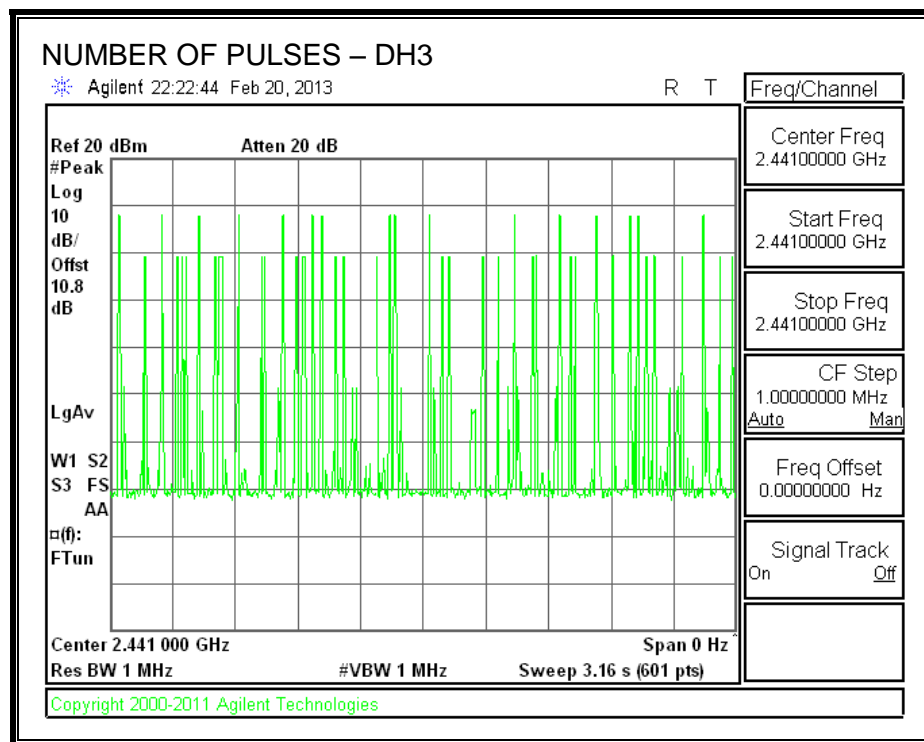




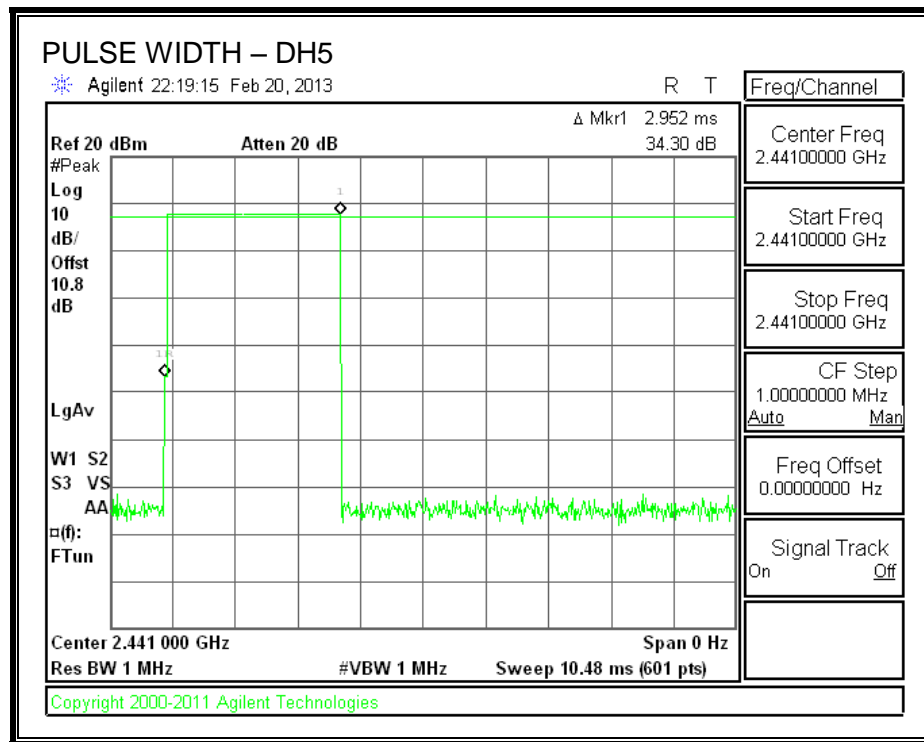
### PULSE WIDTH – DH3



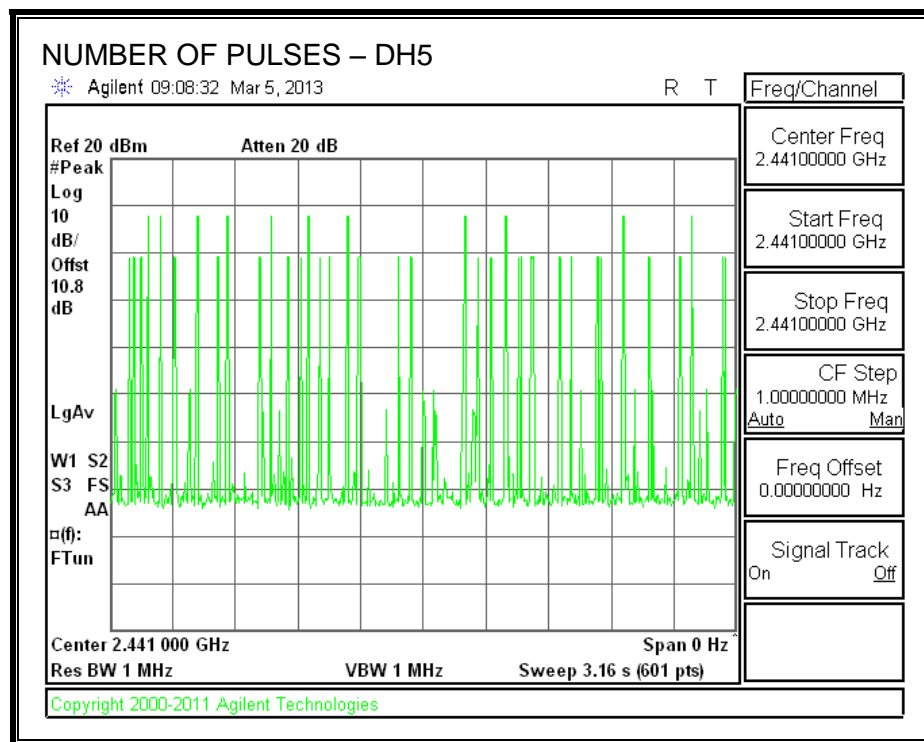
### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



## 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 21 dBm.

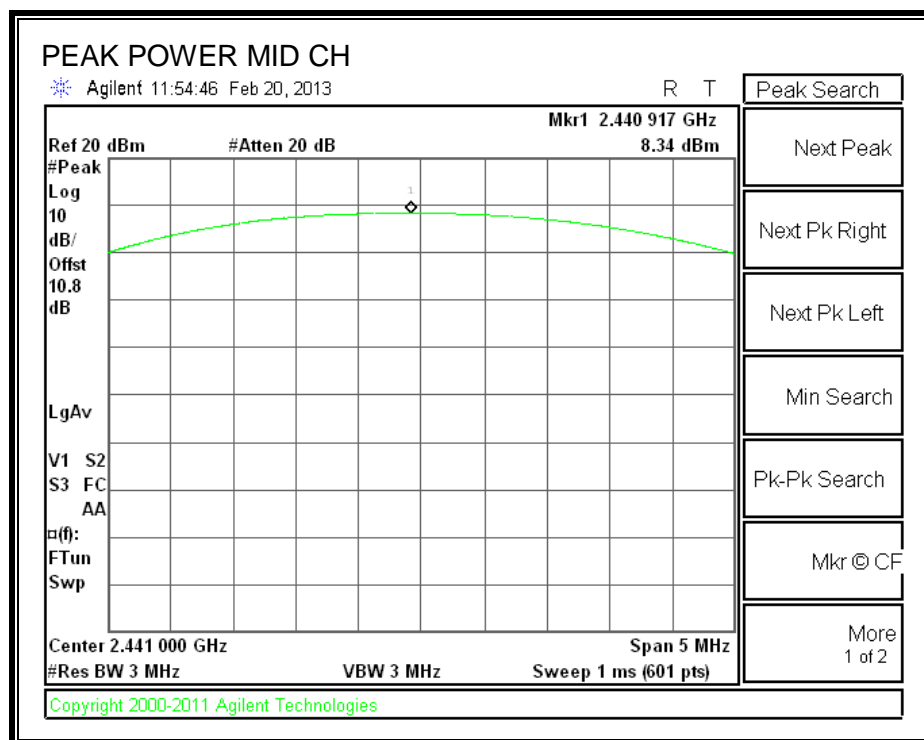
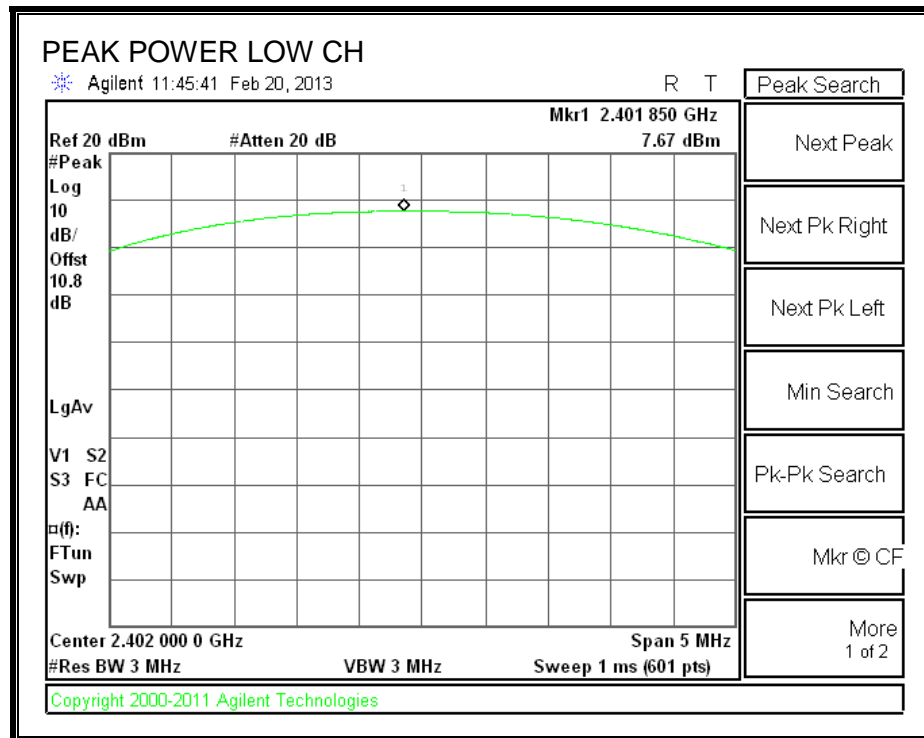
#### TEST PROCEDURE

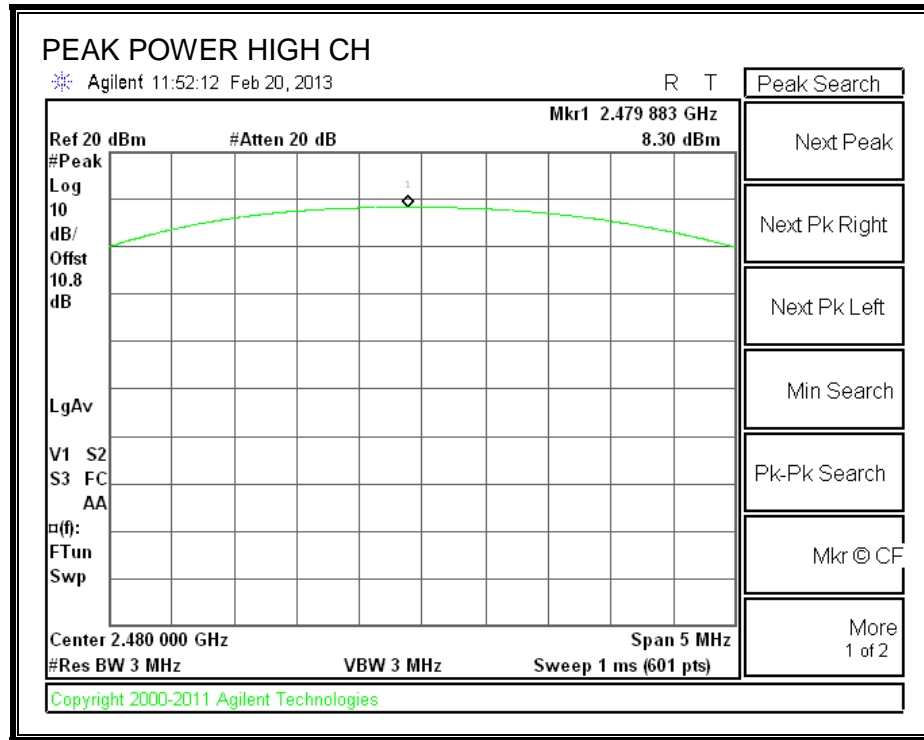
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	7.67	21	-13.33
Middle	2441	8.34	21	-12.66
High	2480	8.30	21	-12.70

## 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 0.4 dB (including 0 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	7.07
Middle	2441	7.55
High	2480	7.59

### **7.1.7. CONDUCTED SPURIOUS EMISSIONS**

#### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

#### **TEST PROCEDURE**

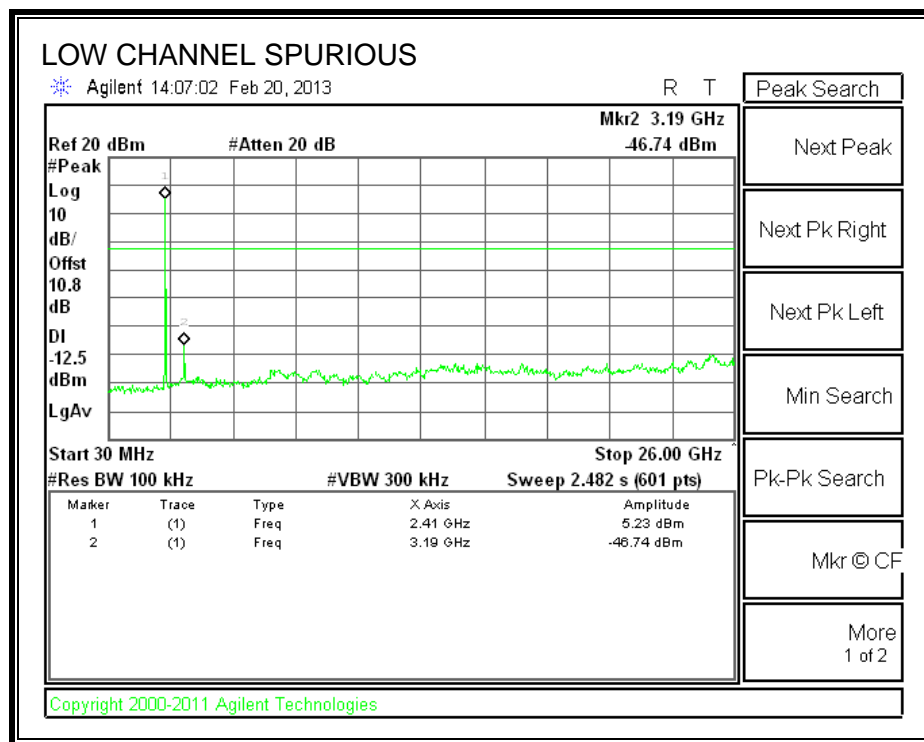
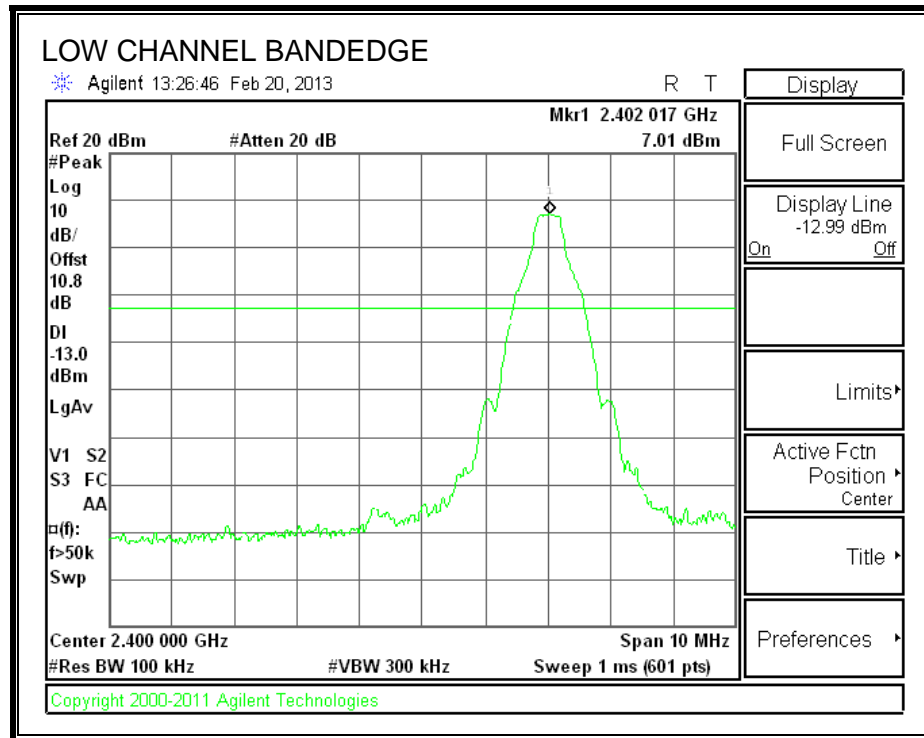
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

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

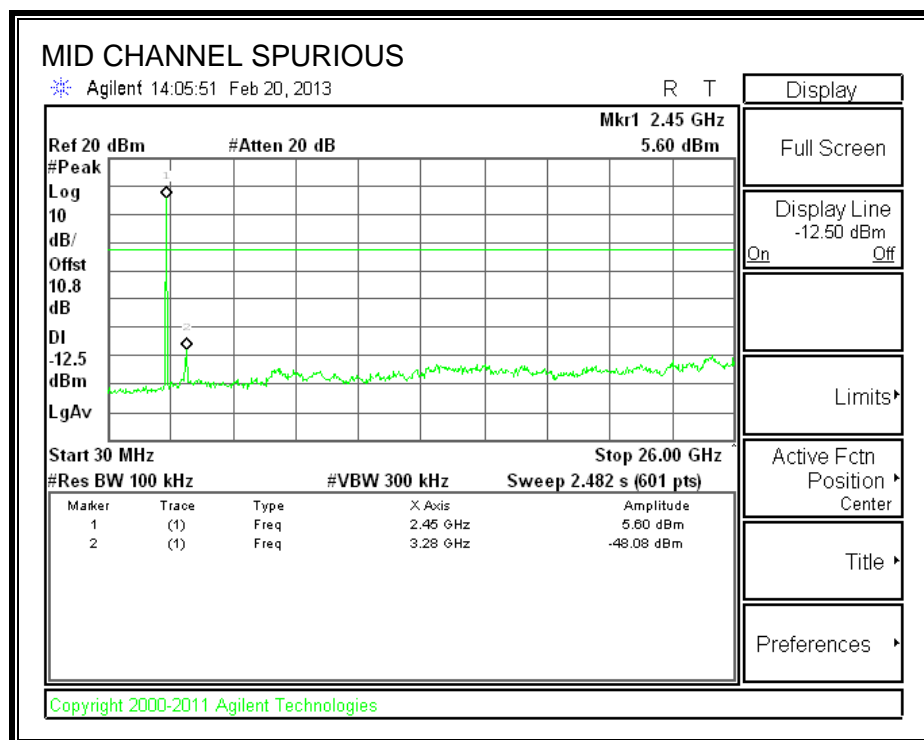
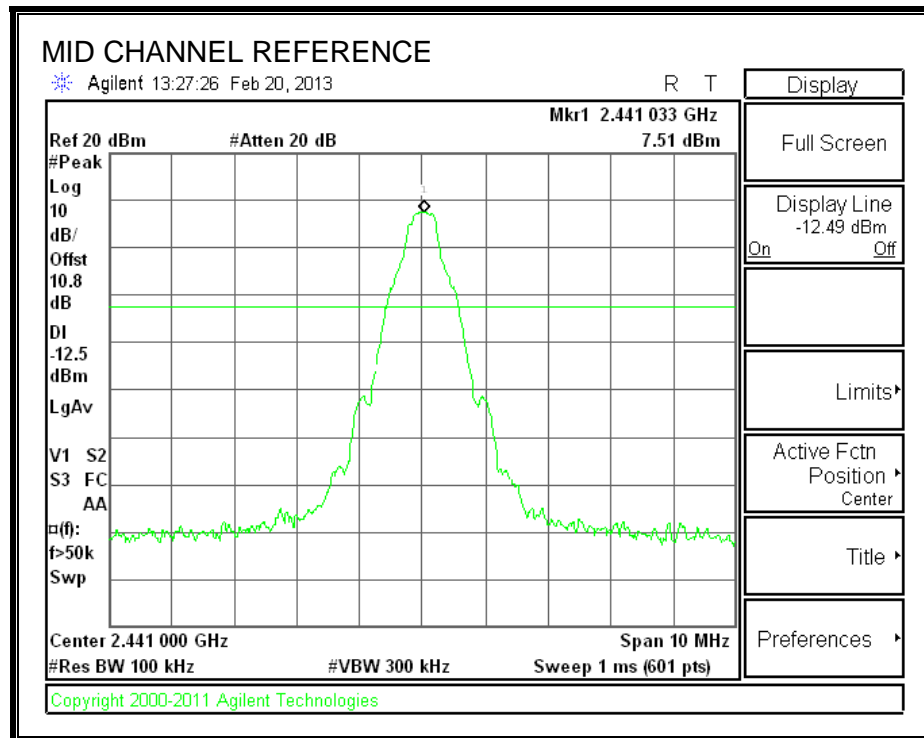
## RESULTS

### SPURIOUS EMISSIONS, LOW CHANNEL

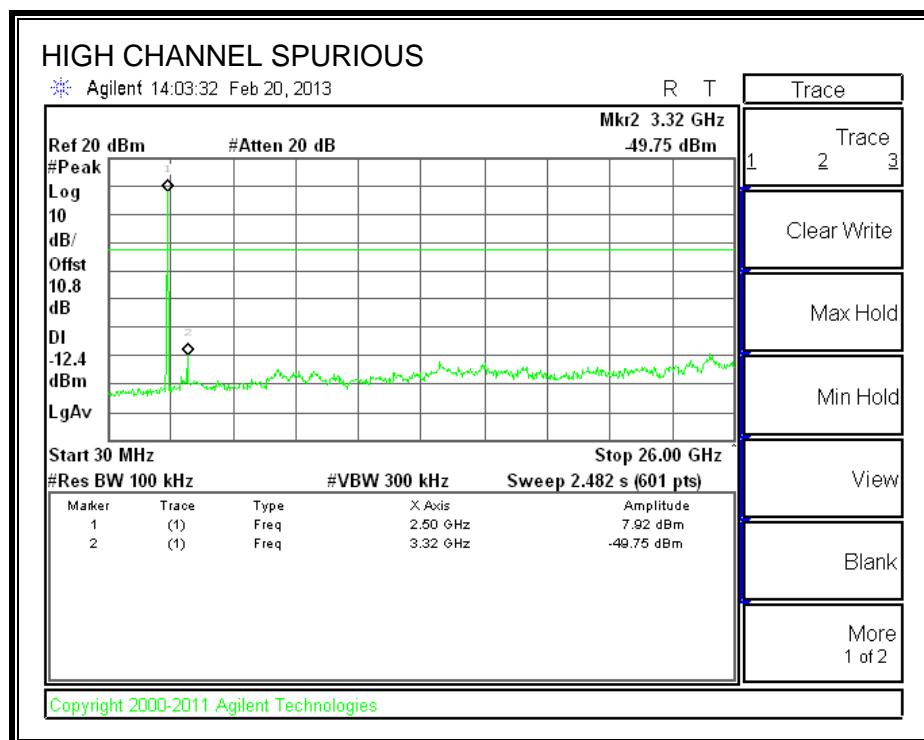
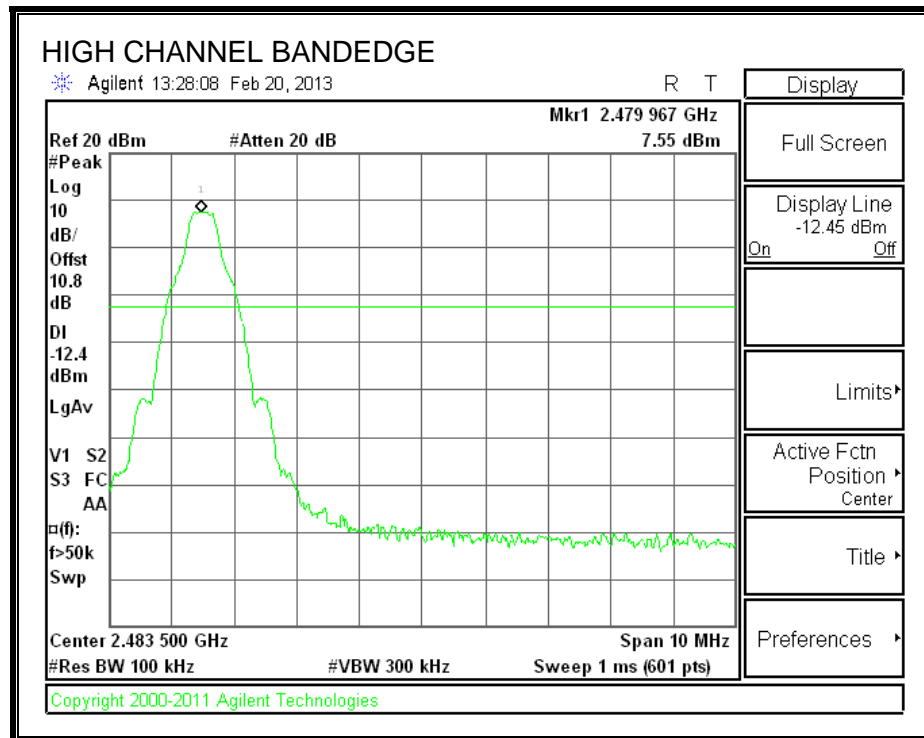




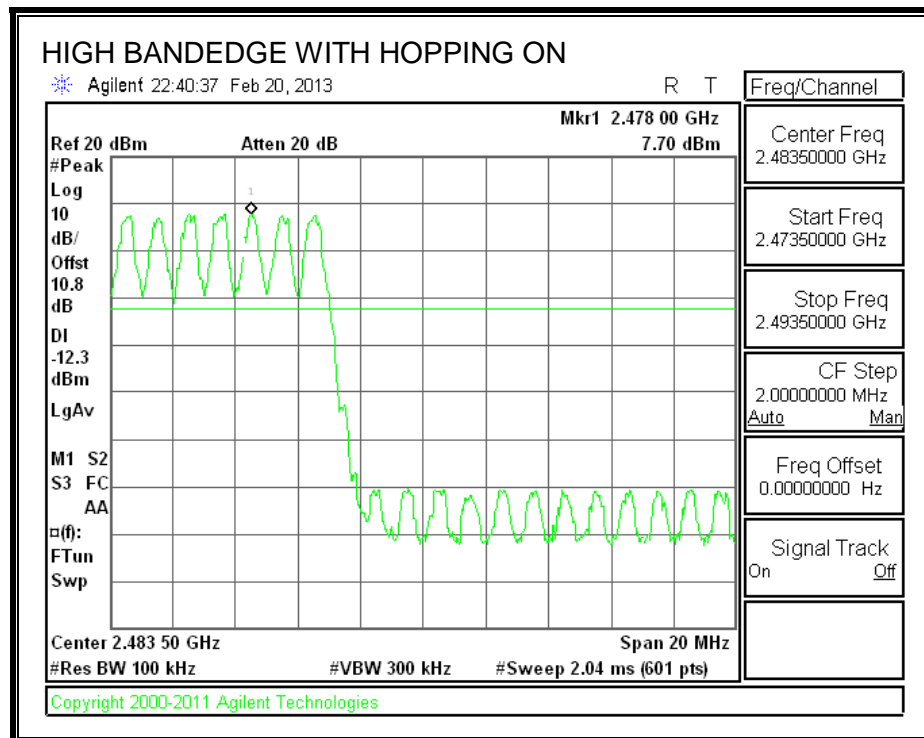
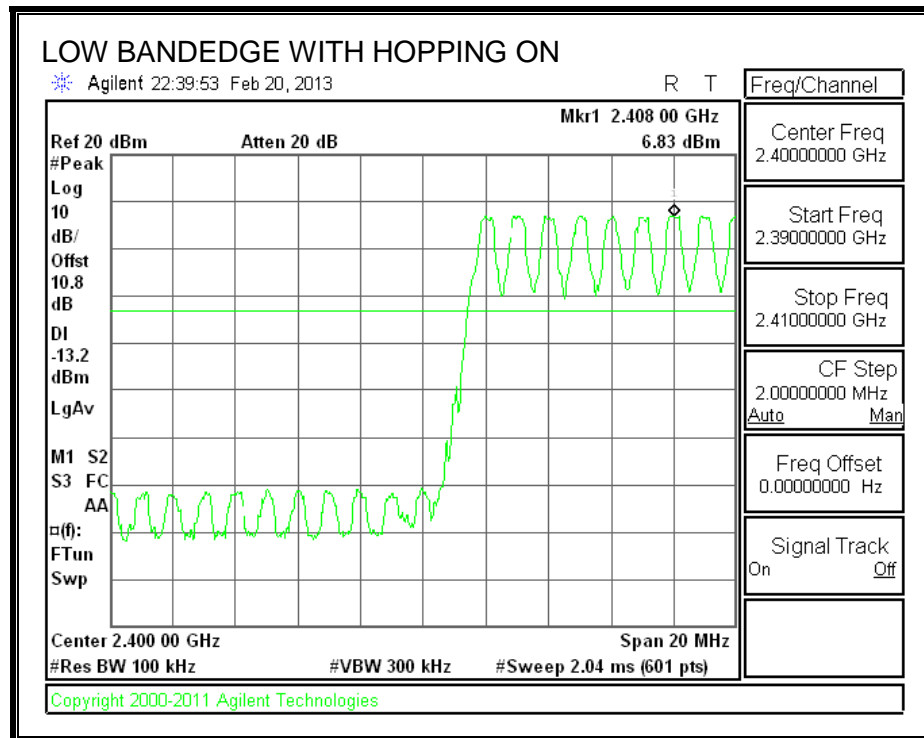
# SPURIOUS EMISSIONS, MID CHANNEL



## 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.

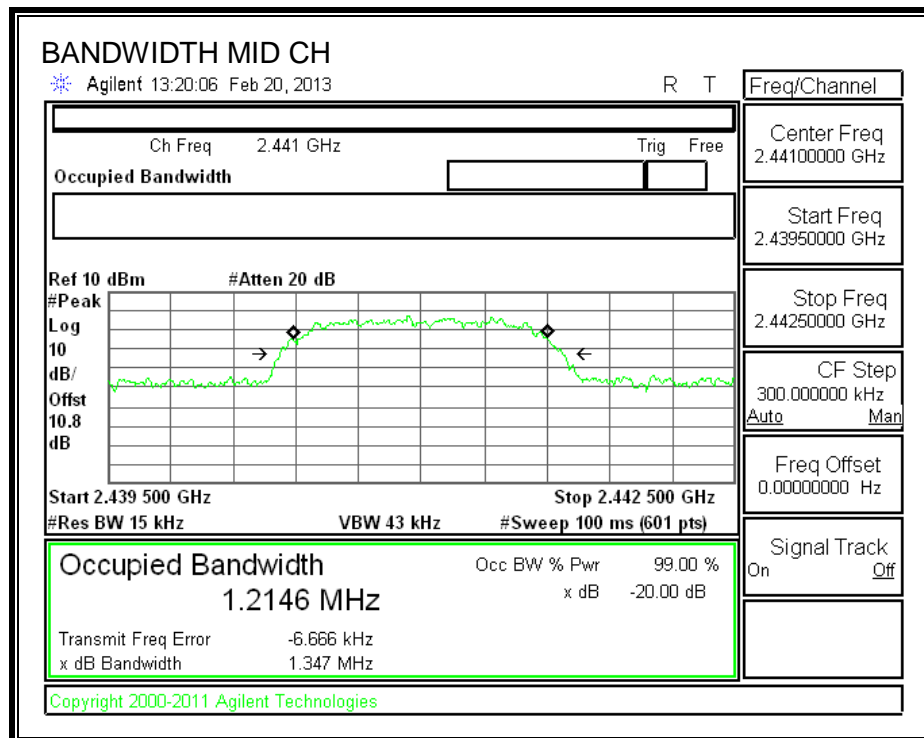
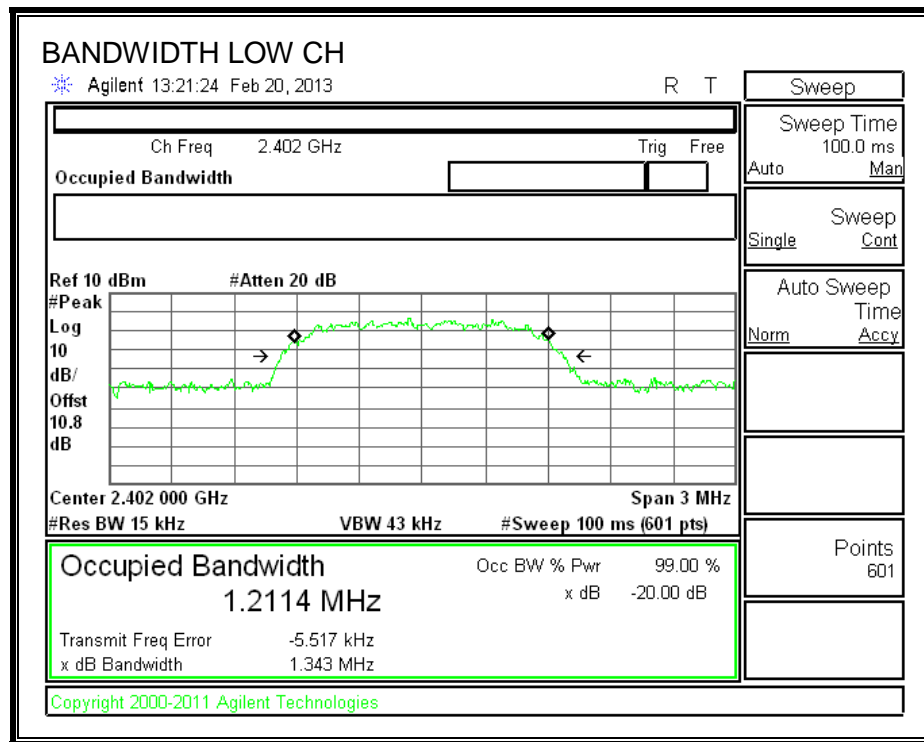
#### TEST PROCEDURE

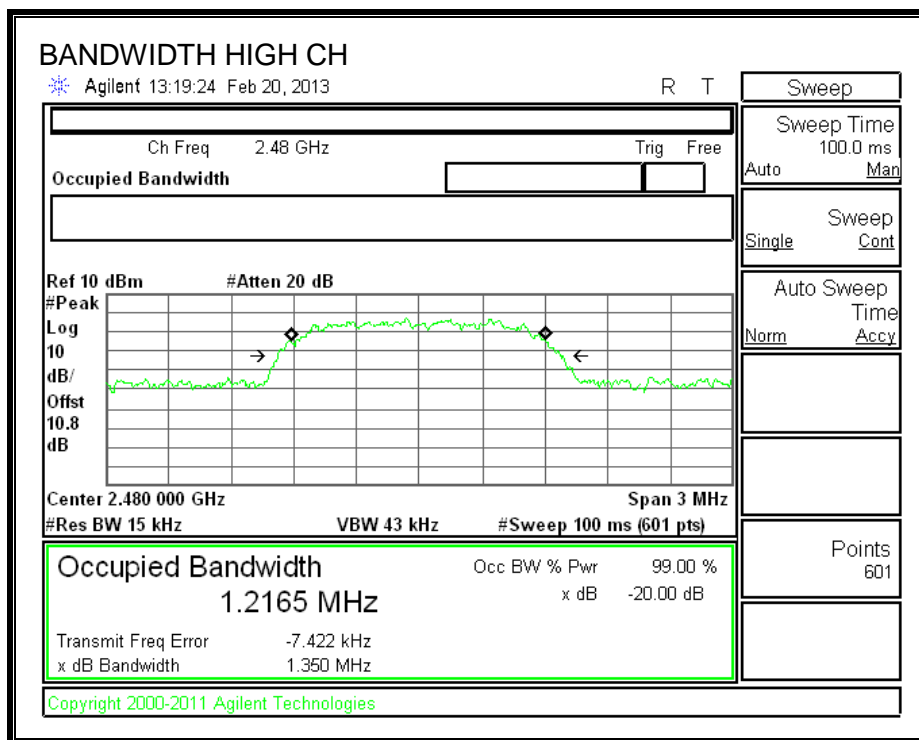
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

#### RESULTS

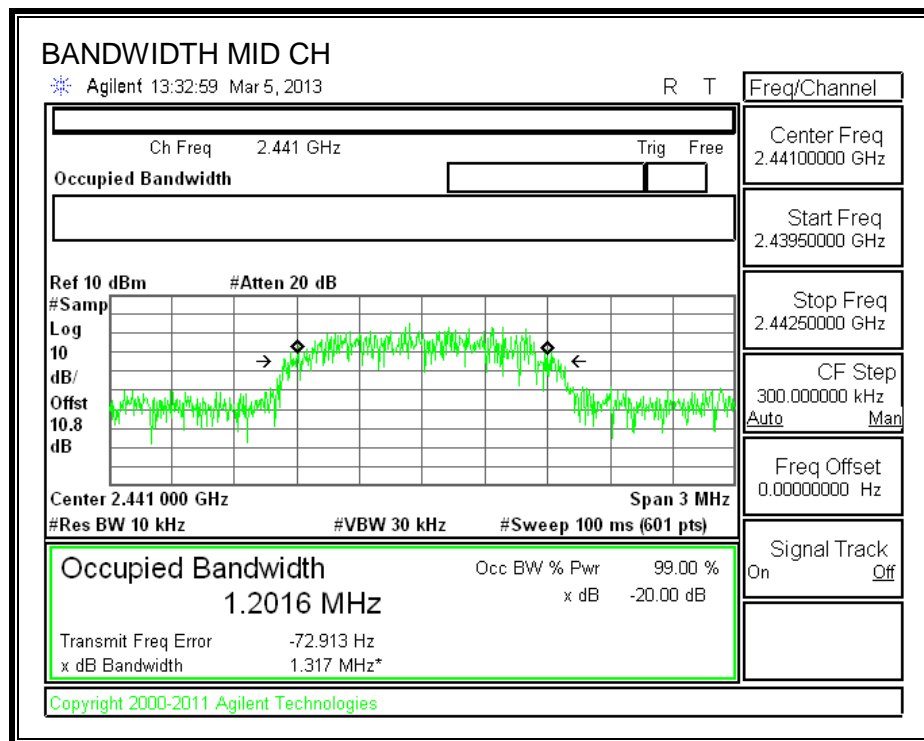
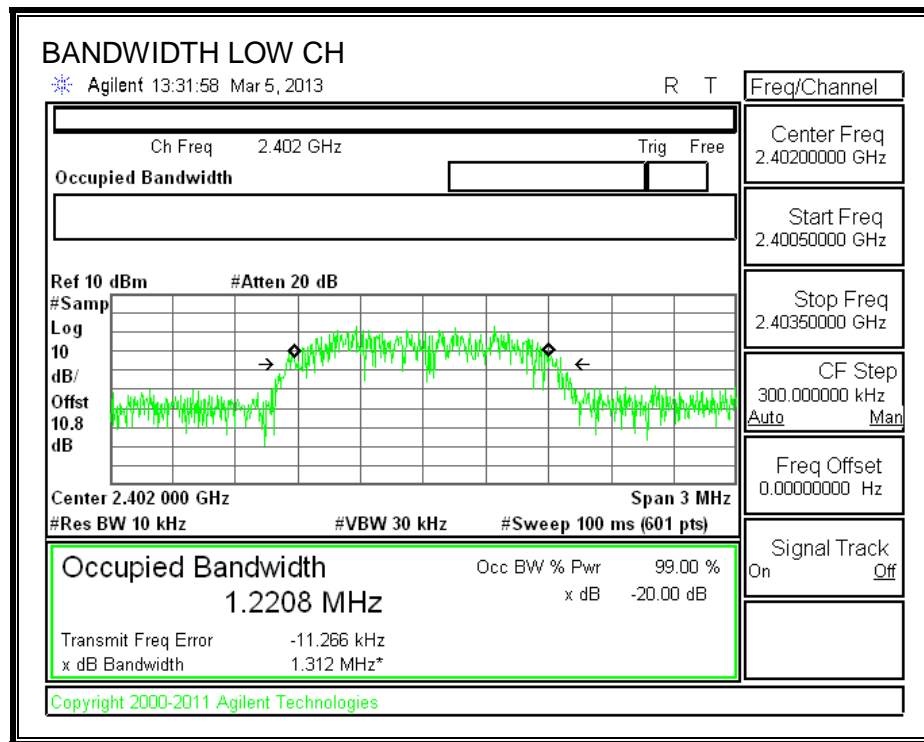
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.343	1.2208
Middle	2441	1.347	1.2016
High	2480	1.350	1.2121

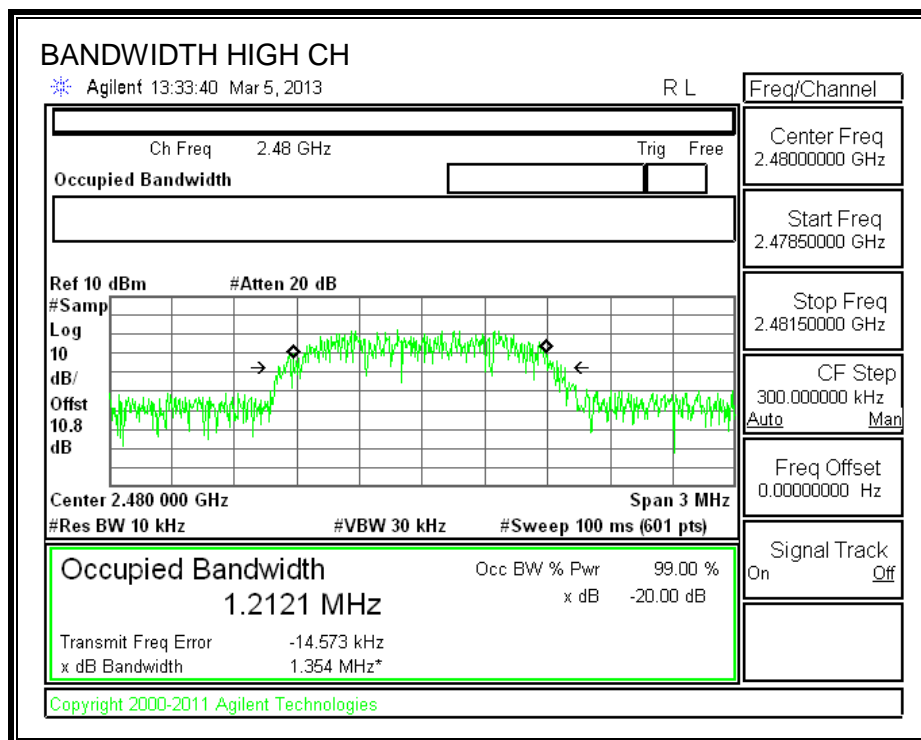
## 20 dB BANDWIDTH





# 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 hopping channel, whichever is greater.

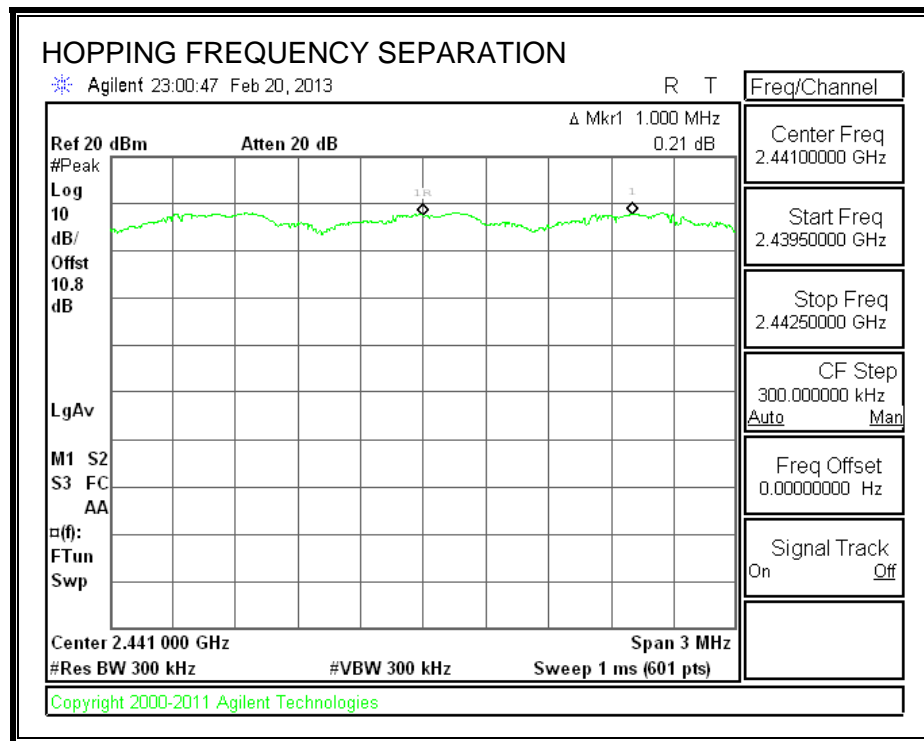
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

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**

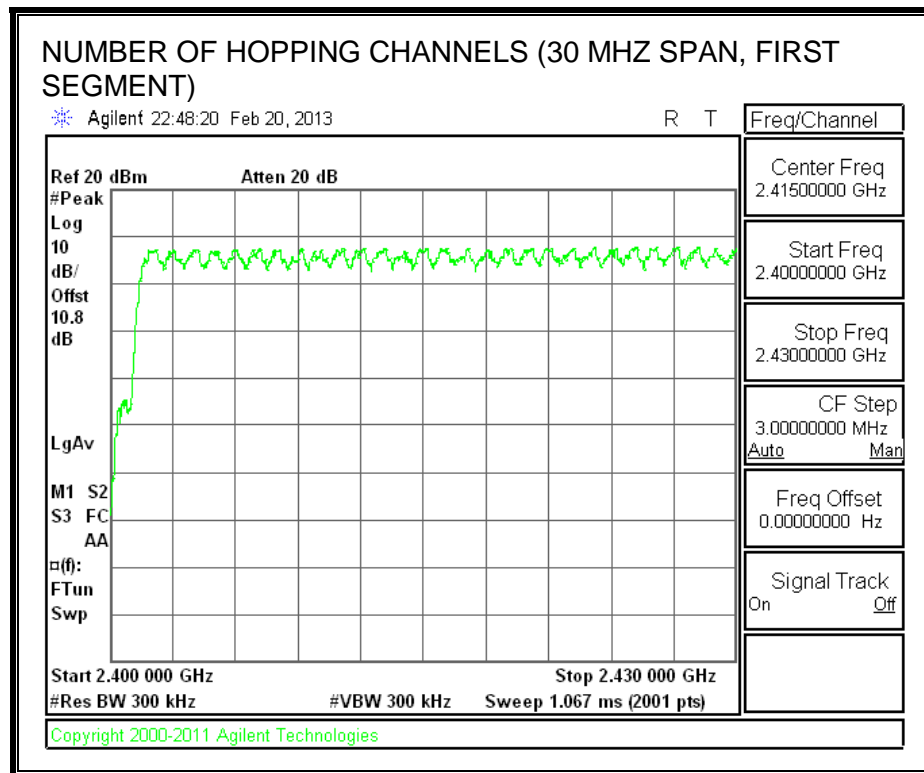
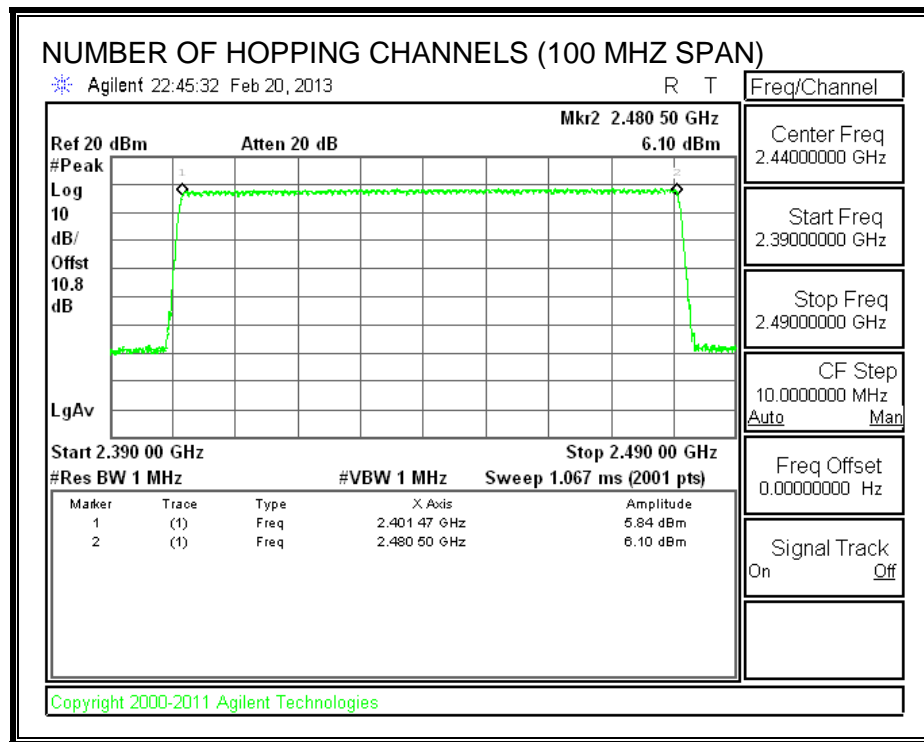
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

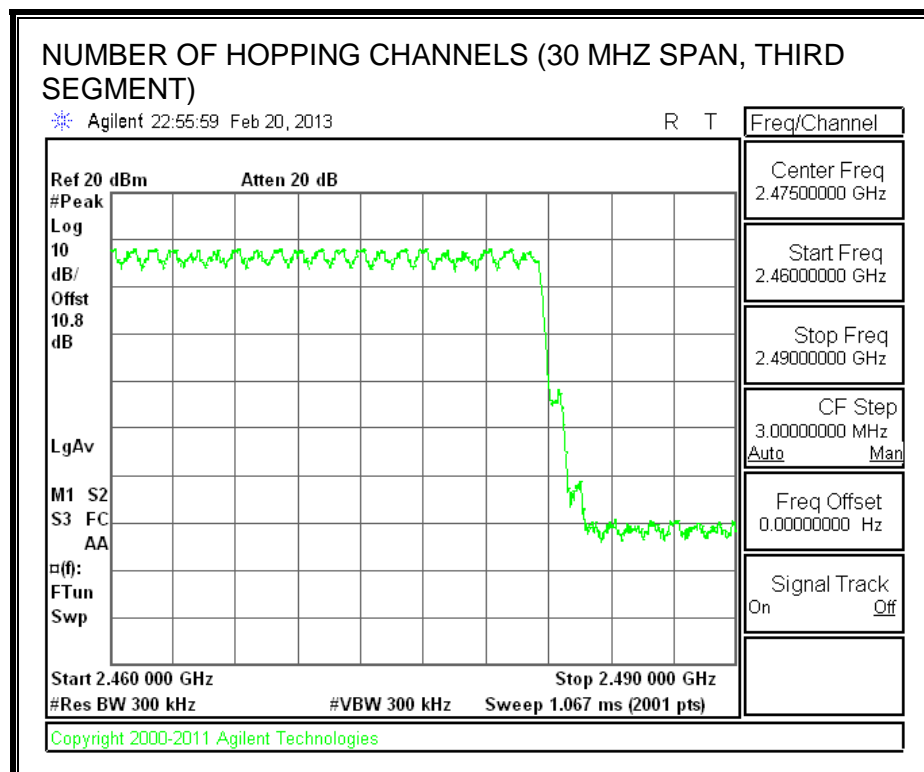
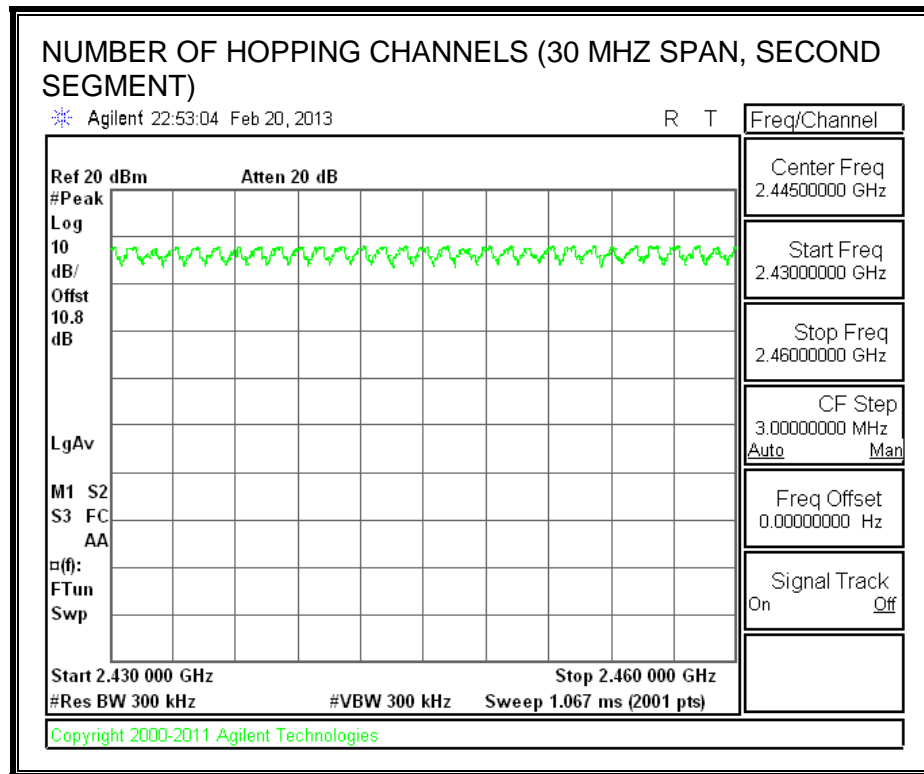
#### **RESULTS**

Normal Mode: 79 Channels observed.

AFH Mode: a minimum number of 20 channels declared by the client

# **NUMBER OF HOPPING CHANNELS**





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

### RESULTS

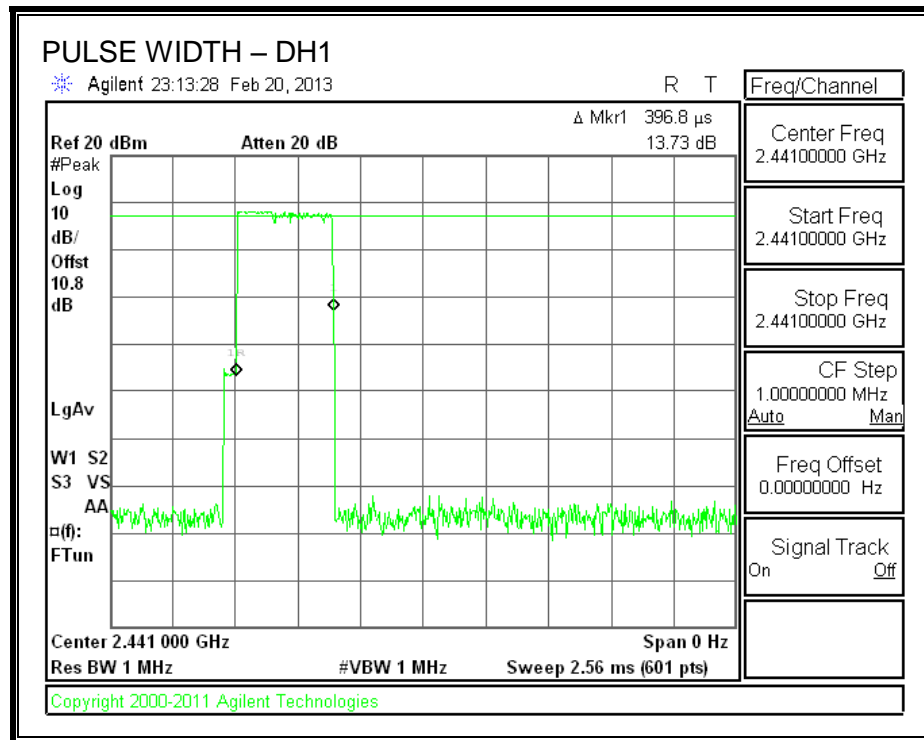
Time Of Occupancy =  $10 * xx \text{ pulses} * yy \text{ msec} = zz \text{ msec}$

#### 8PSK (EDR) Mode

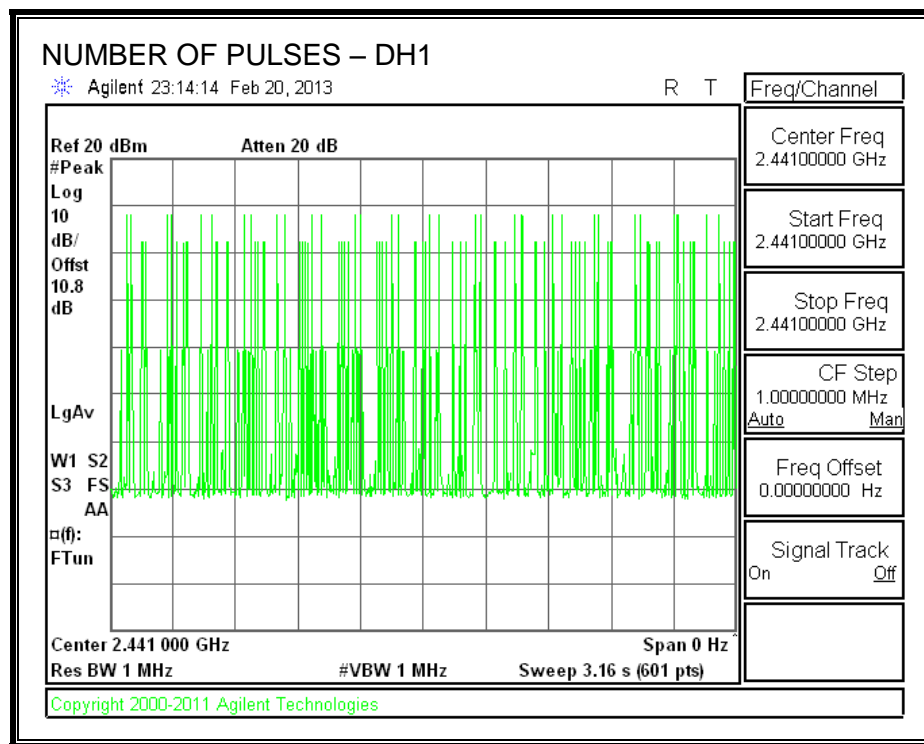
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.3968	32	0.1270	0.4	-0.2730
DH3	1.6670	16	0.2667	0.4	-0.1333
DH5	2.9130	12	0.3496	0.4	-0.0504

**Note:** This device supports adaptive frequency hopping (AFH) which uses the same pseudo random channel selection algorithm as is used for non AFH mode. By showing compliance with the channel dwell time requirements for 79 channels, since the dwell time requirements are based on the number of channels compliance is also demonstrated for N channels where  $20 \leq N \leq 79$ .

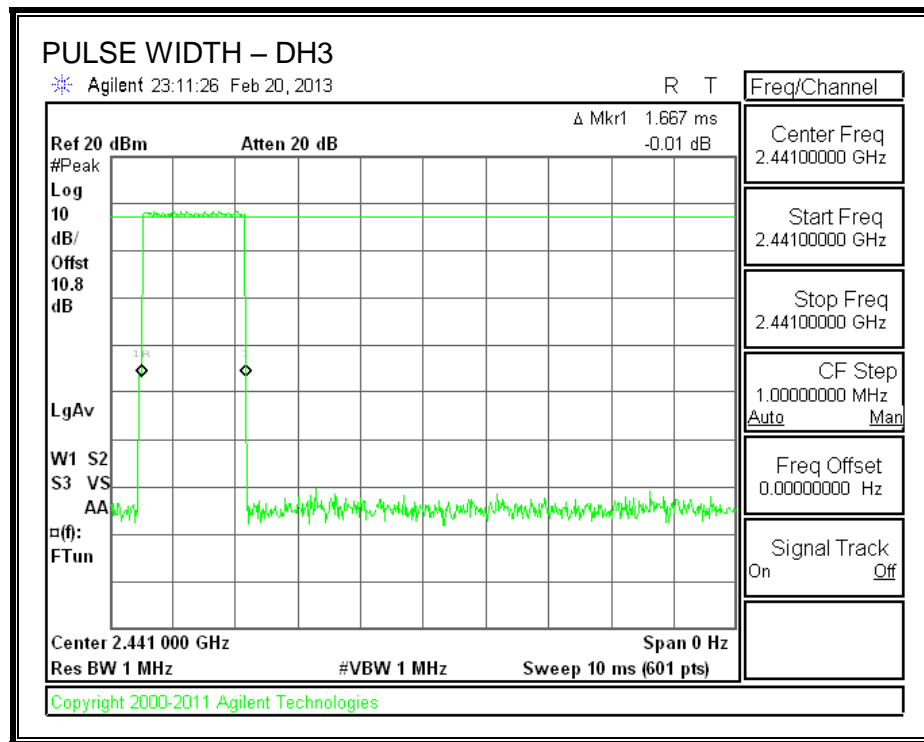
## PULSE WIDTH - DH1



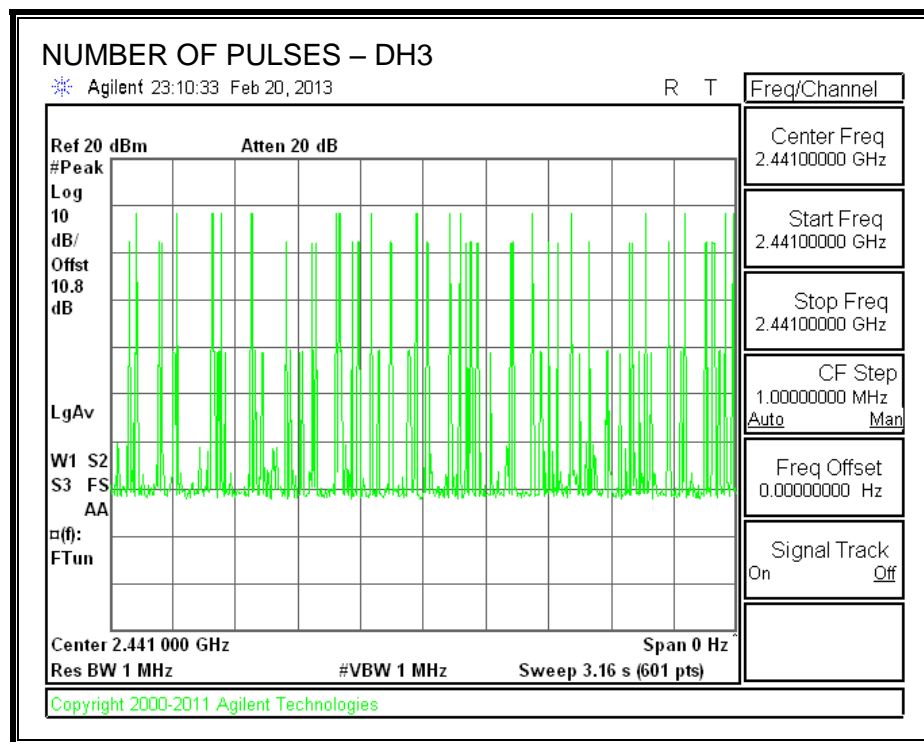
## NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



### PULSE WIDTH – DH3

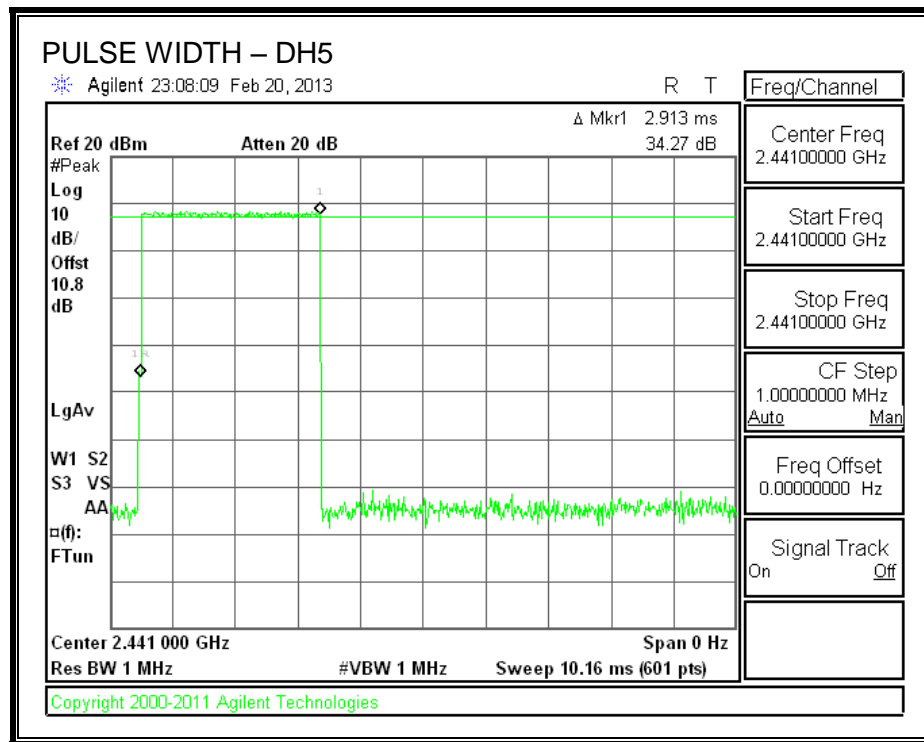


### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3

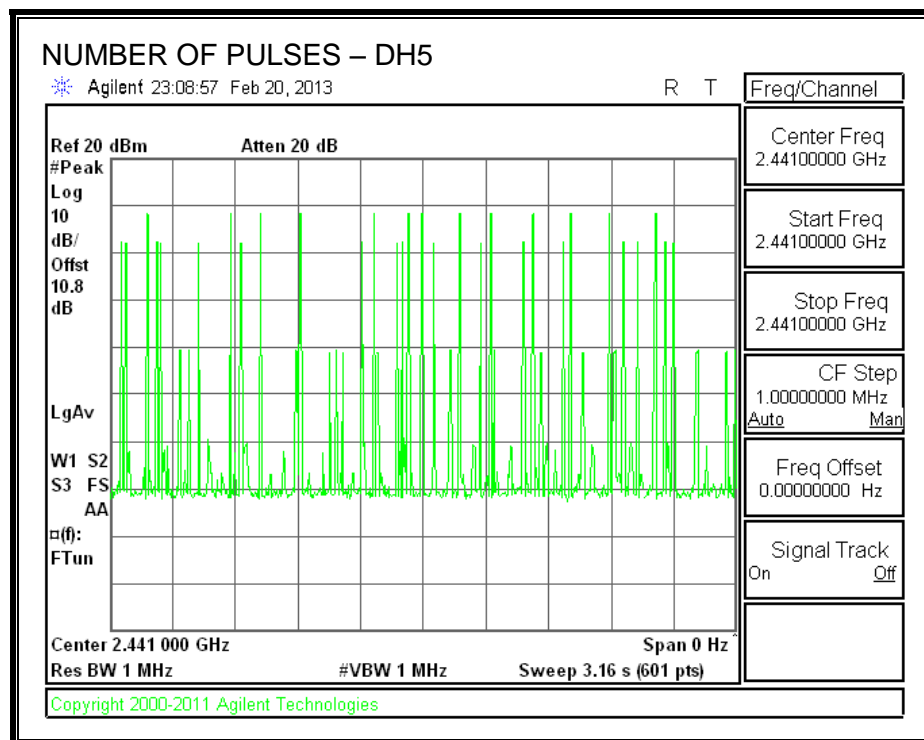




## PULSE WIDTH – DH5



## 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 20.97 dBm.

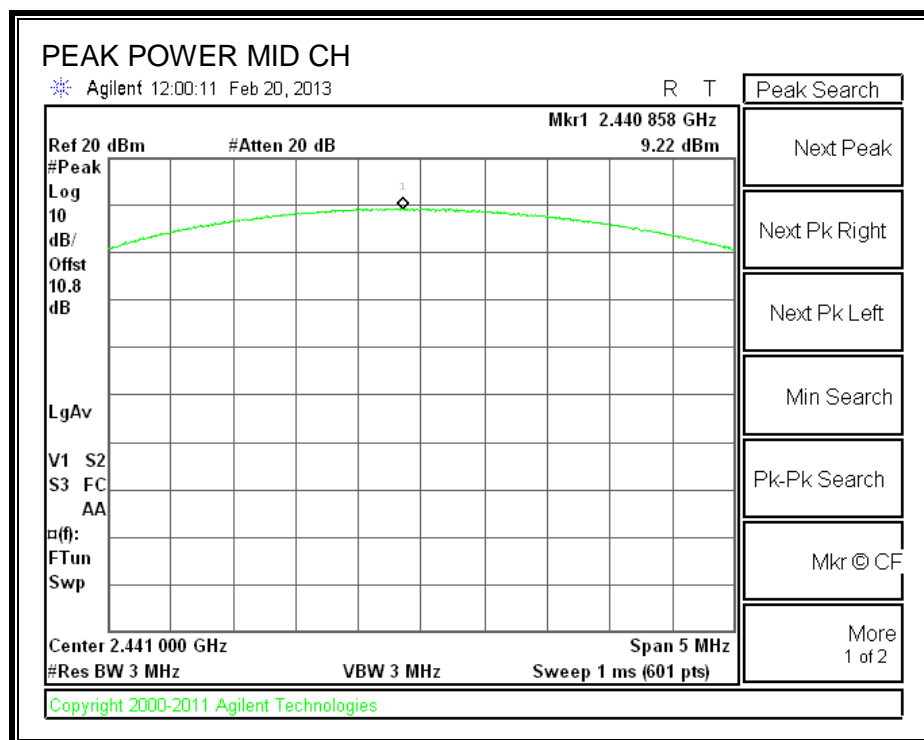
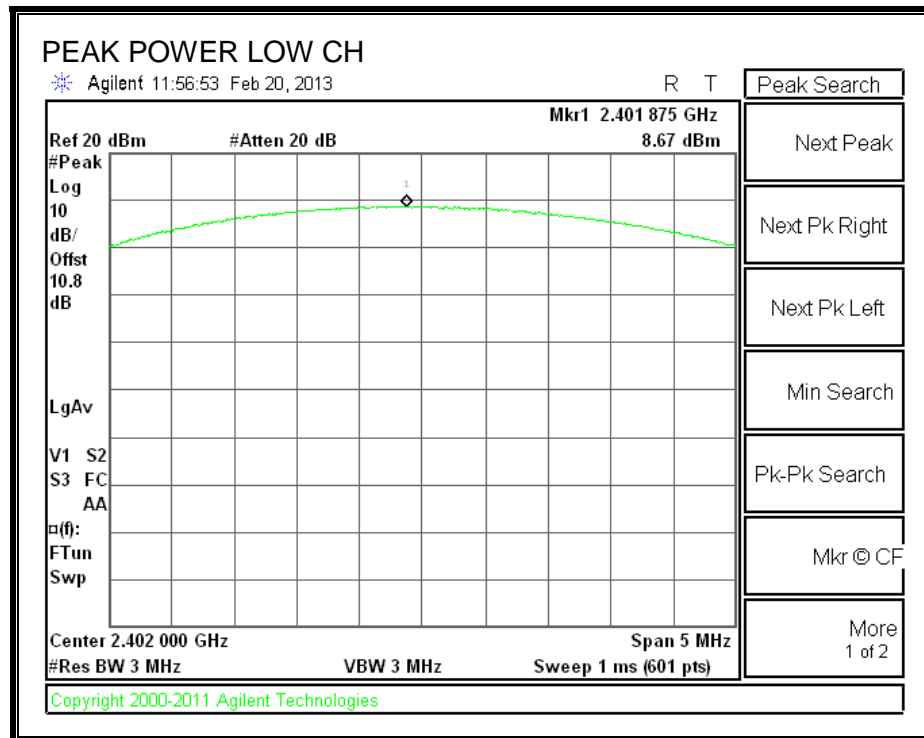
### TEST PROCEDURE

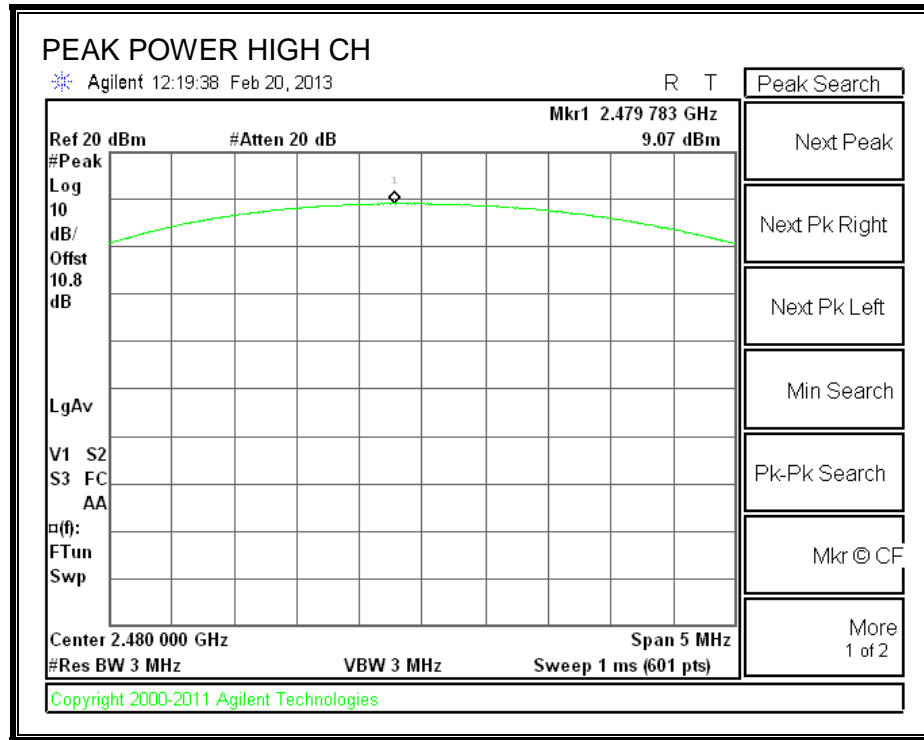
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	8.67	20.97	-12.30
Middle	2441	9.22	20.97	-11.75
High	2480	9.07	20.97	-11.90

## 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 .4 dB (including 0 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	5.84
Middle	2441	6.33
High	2480	6.34

## **7.2.7. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

### **TEST PROCEDURE**

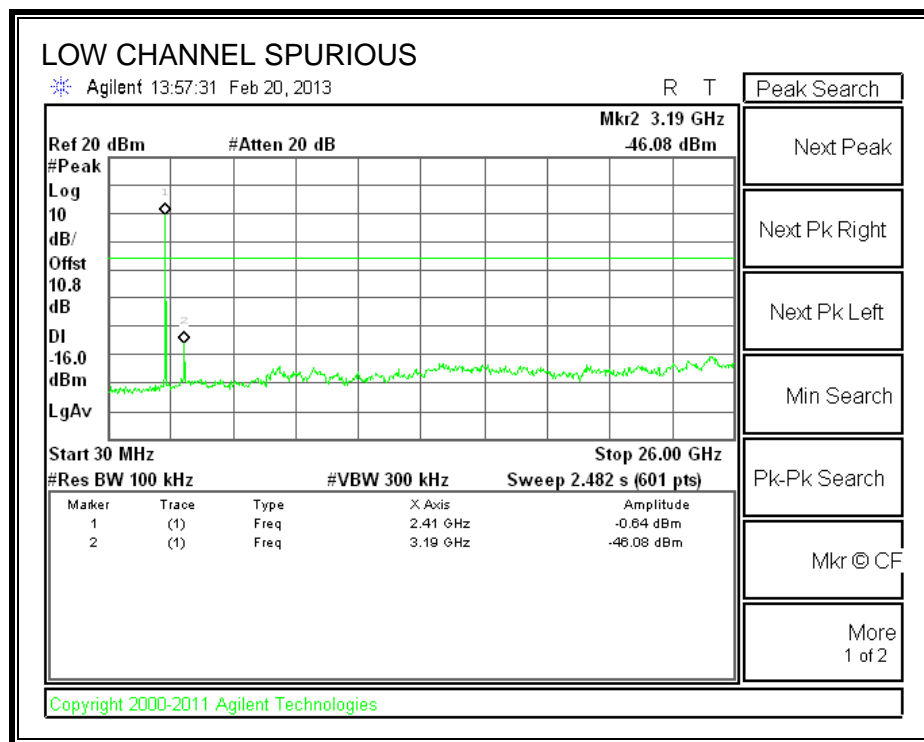
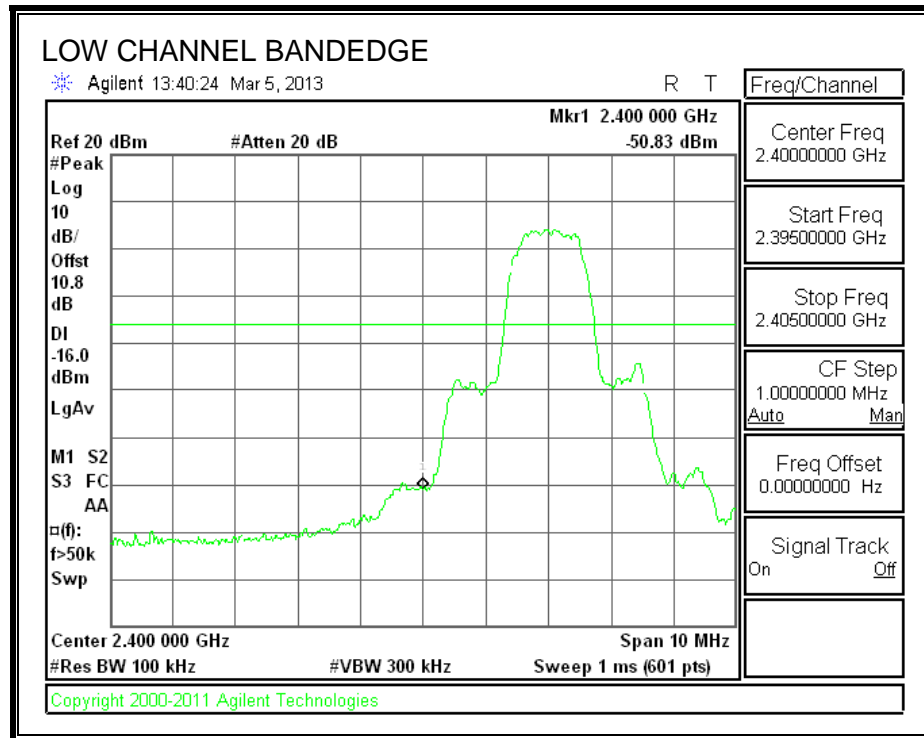
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

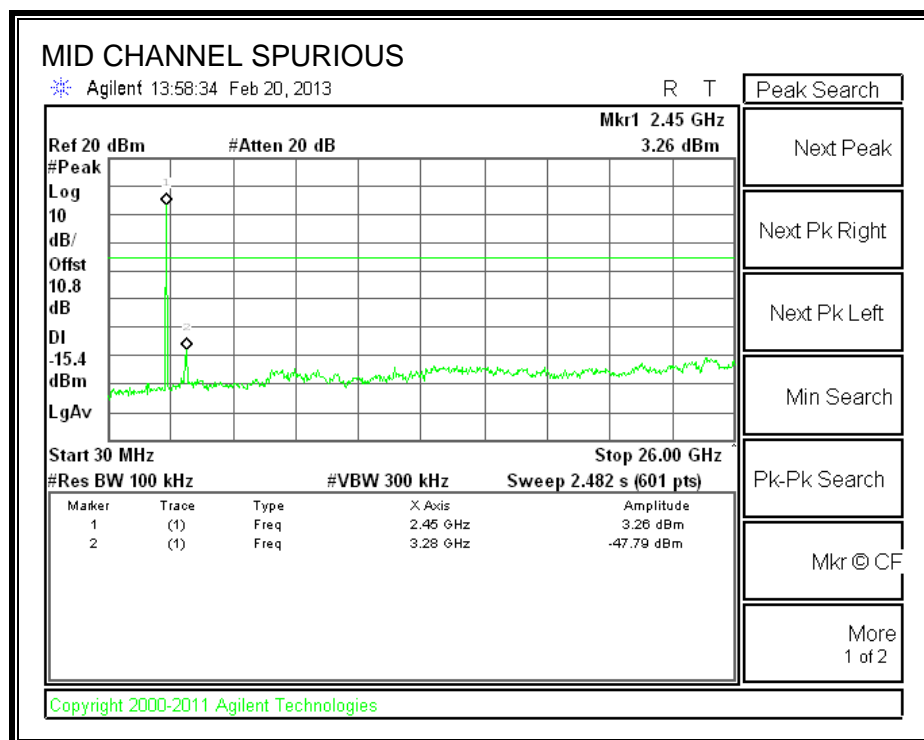
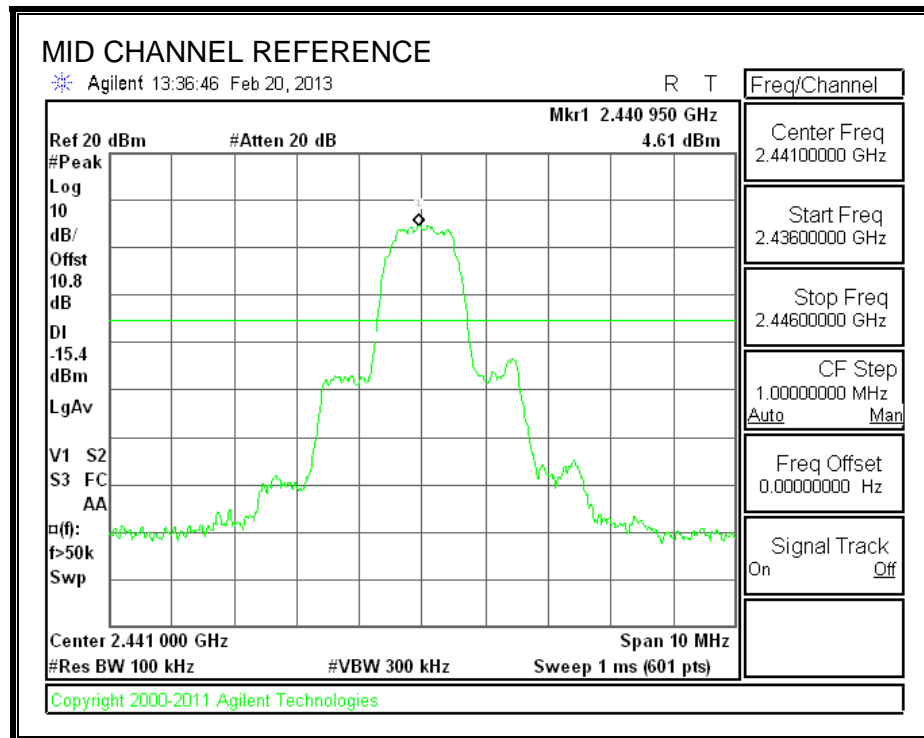
The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

## RESULTS

### SPURIOUS EMISSIONS, LOW CHANNEL

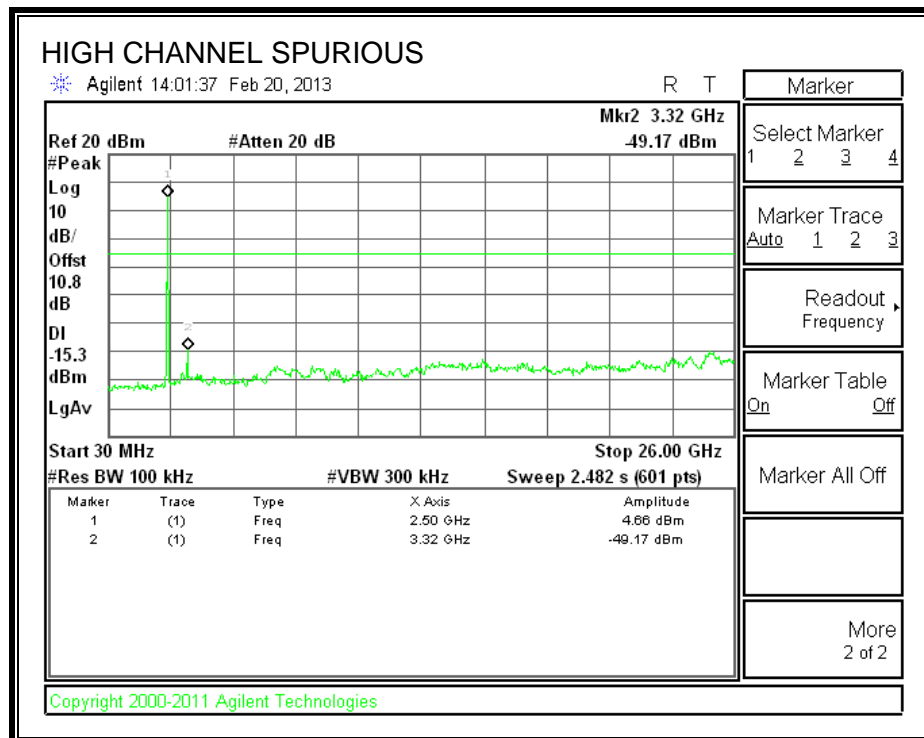
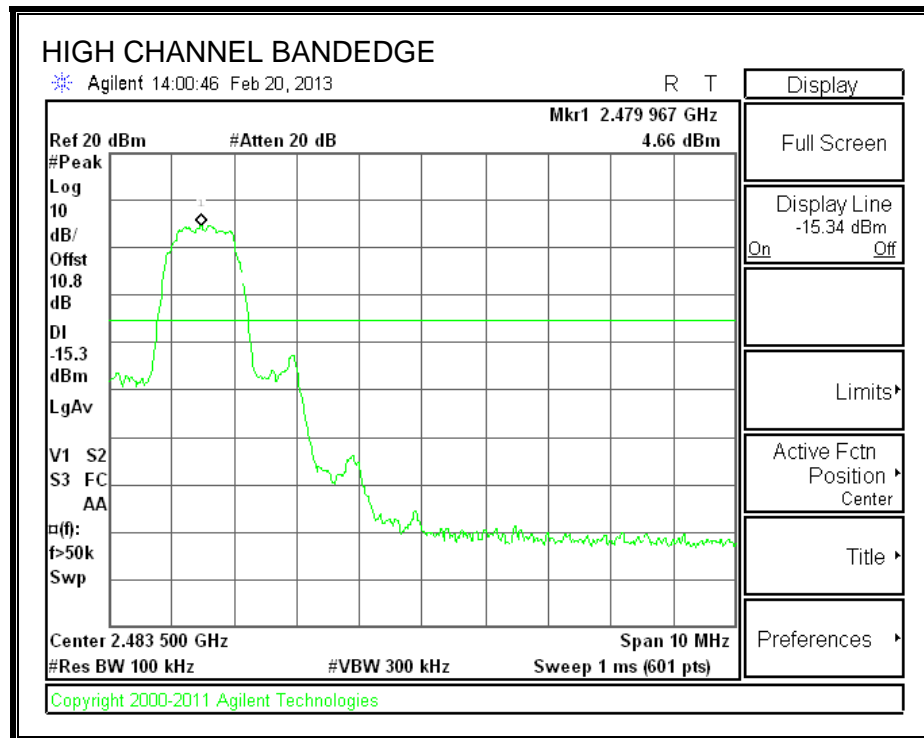


# SPURIOUS EMISSIONS, MID CHANNEL

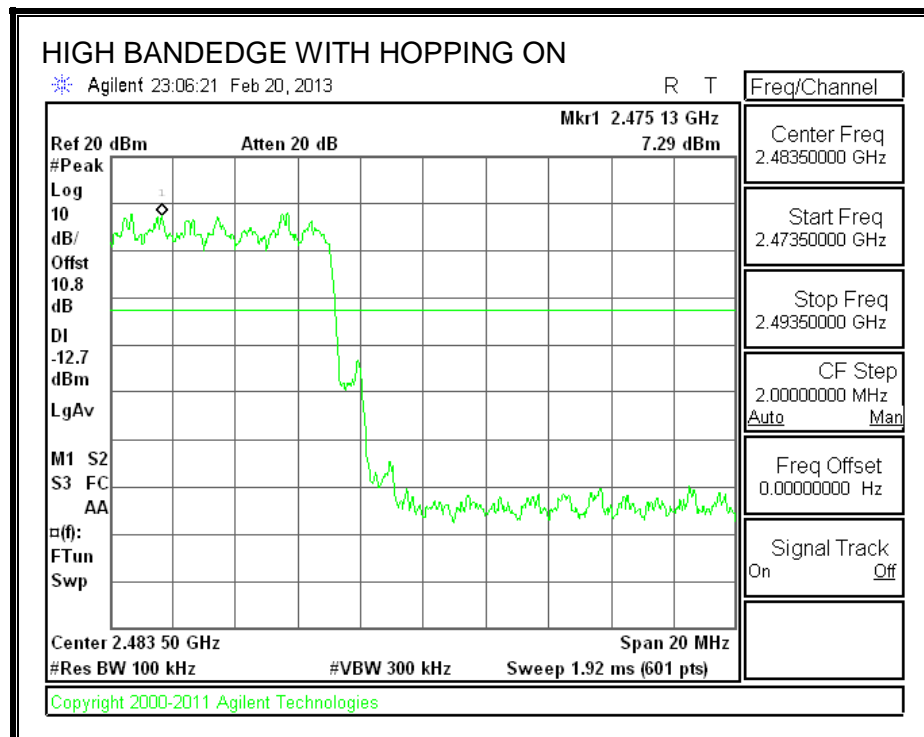
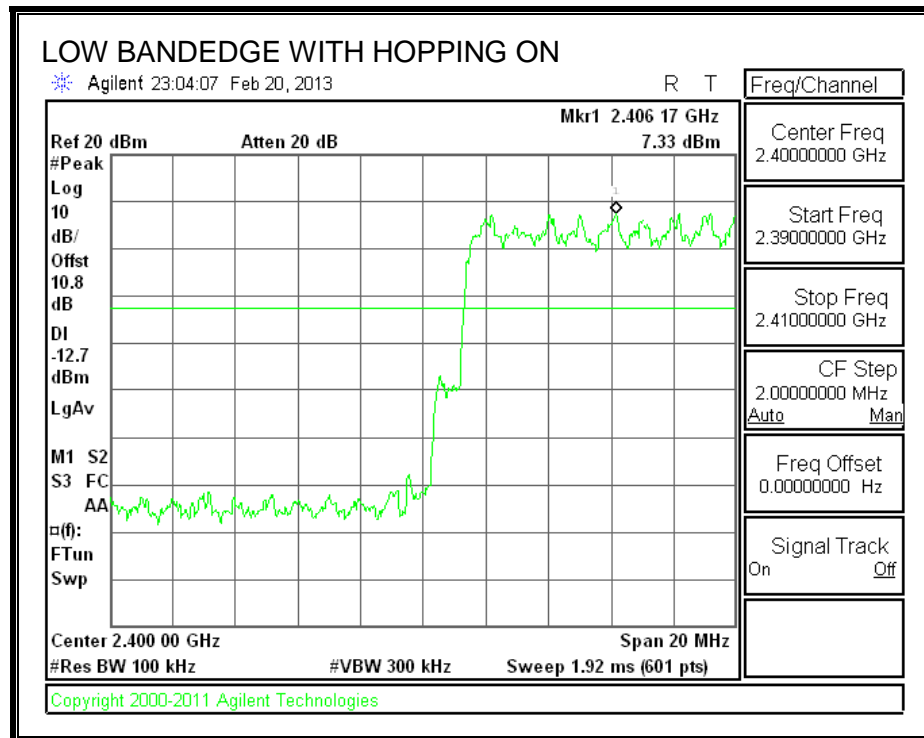




# SPURIOUS EMISSIONS, HIGH CHANNEL



## SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



## 8. RADIATED TEST RESULTS

### 8.1. LIMITS AND PROCEDURE

#### LIMITS

FCC §15.205 and §15.209

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.

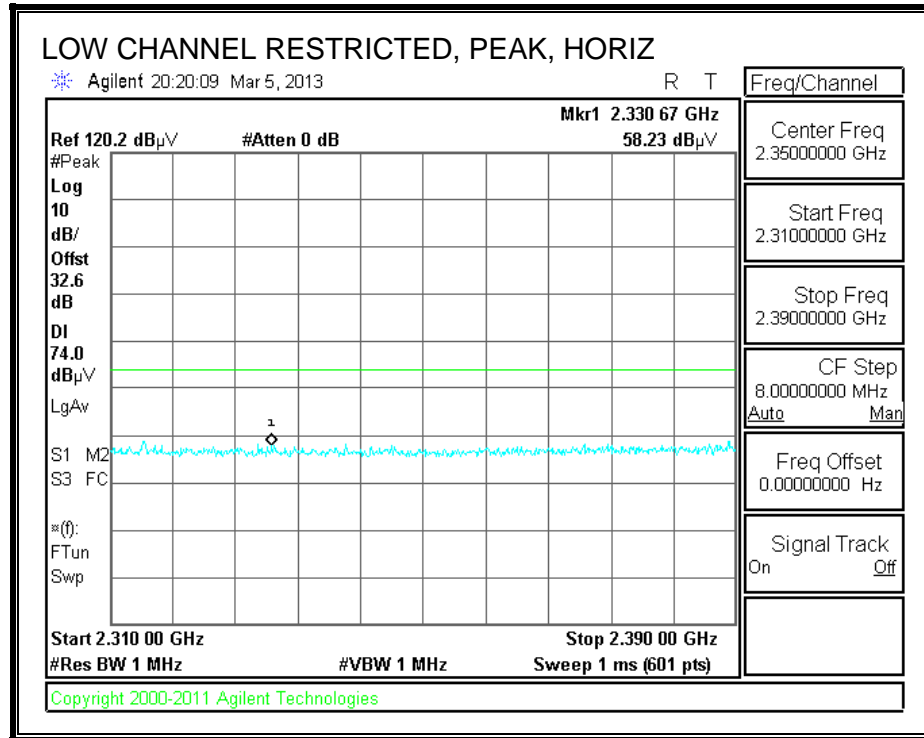
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

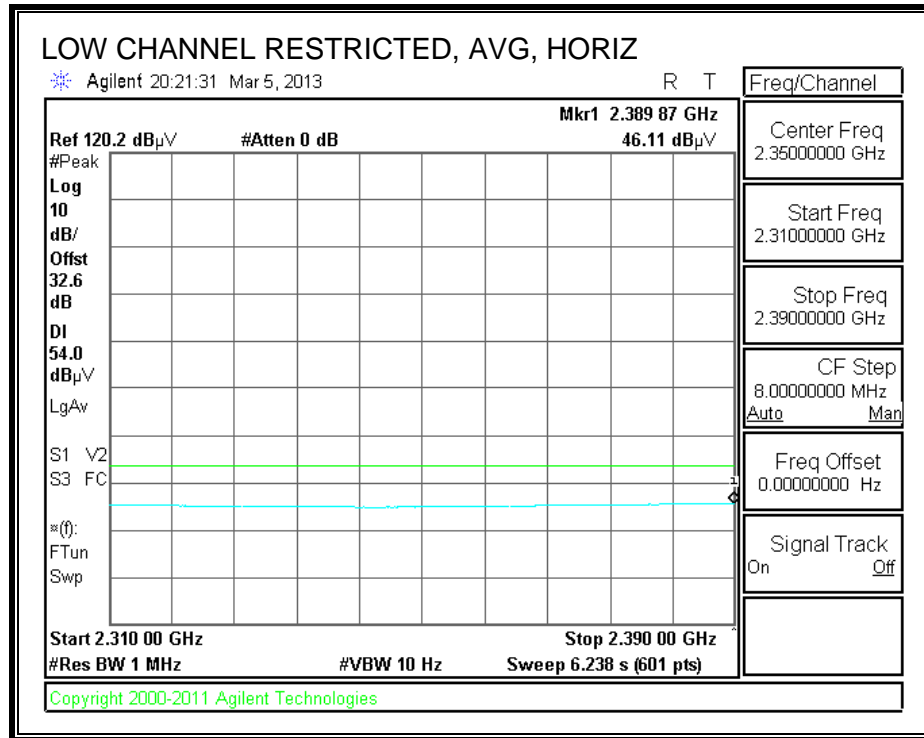
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz

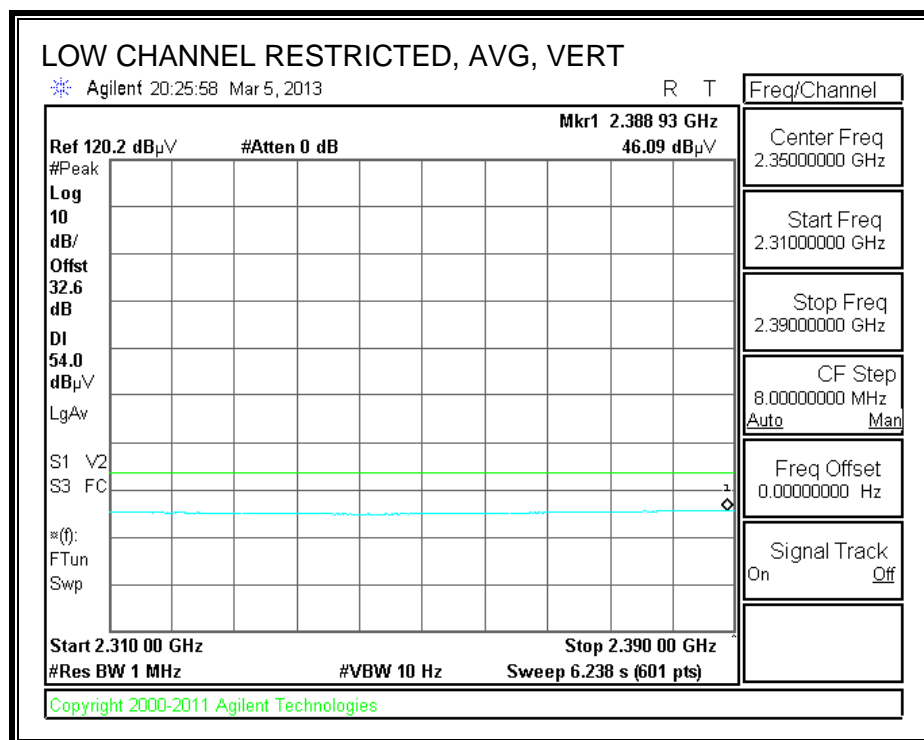
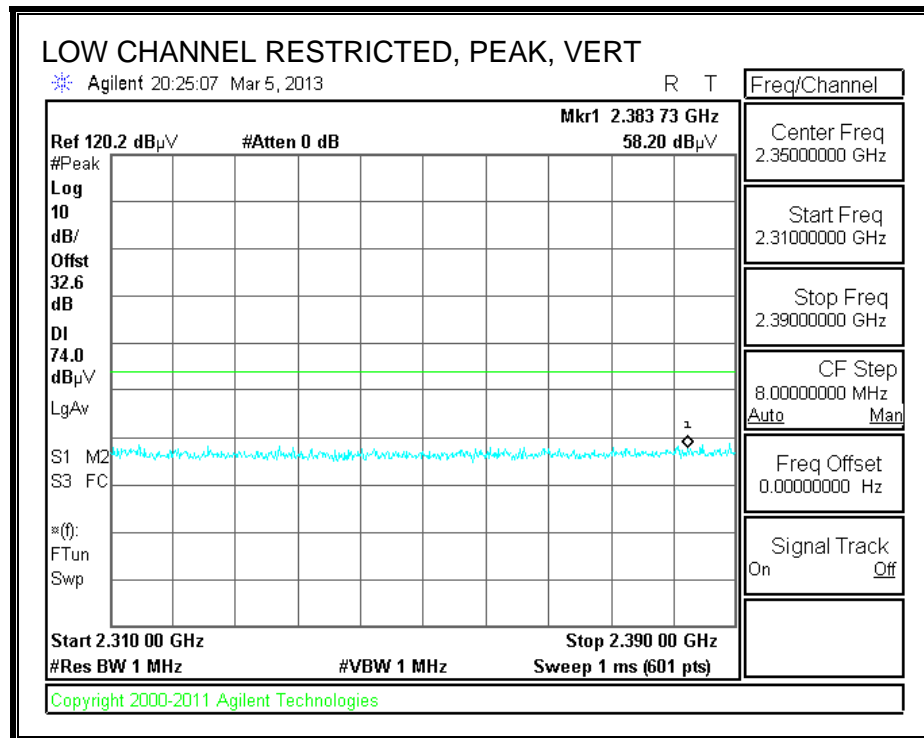
### 8.2.1. BASIC DATA RATE GFSK MODULATION

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

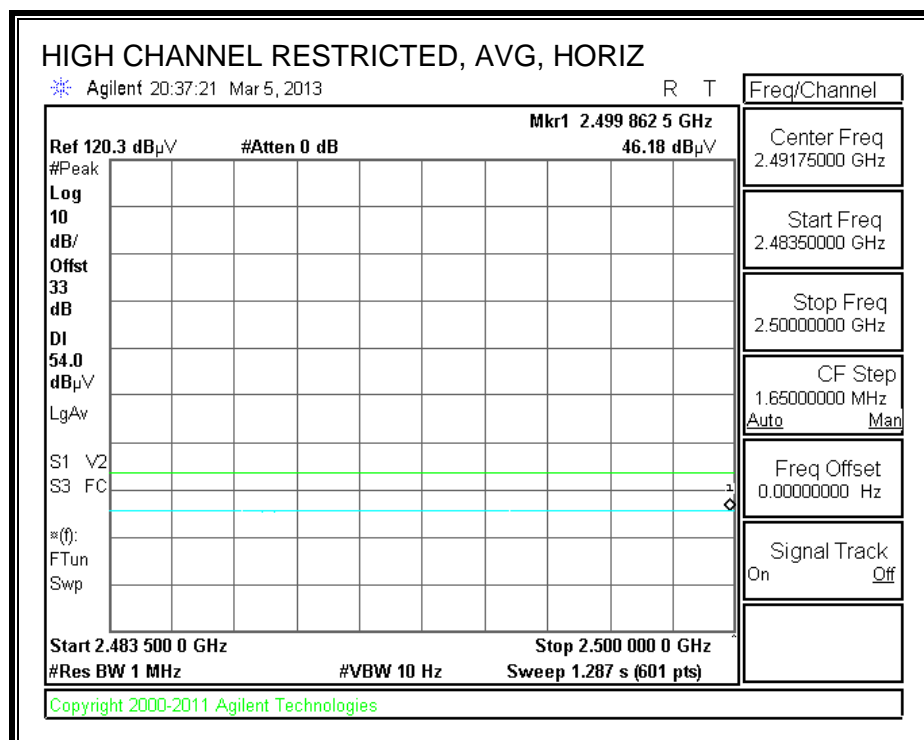
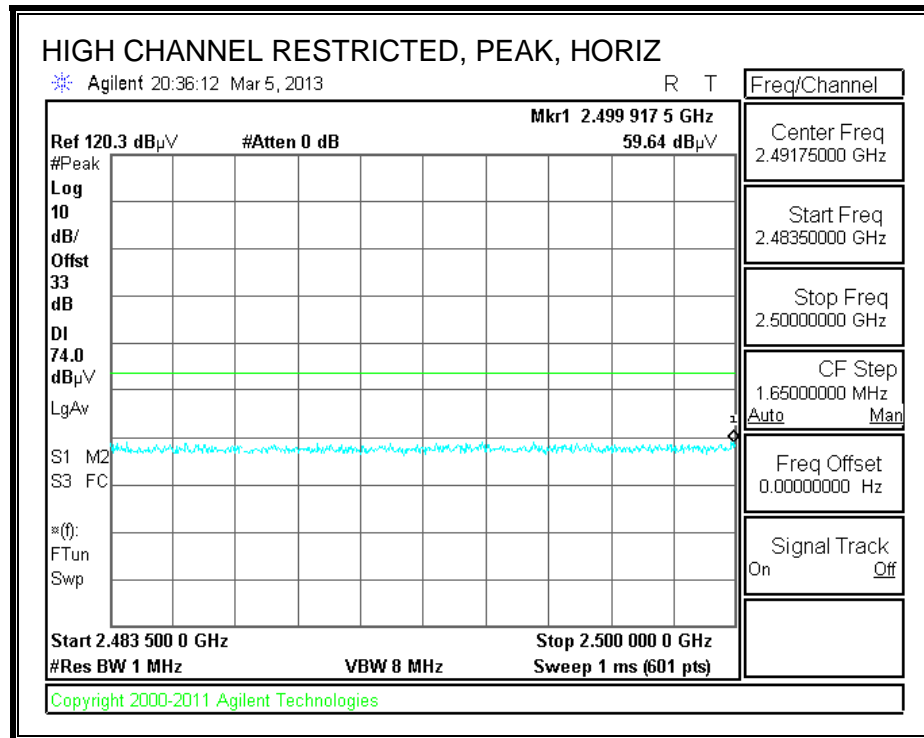




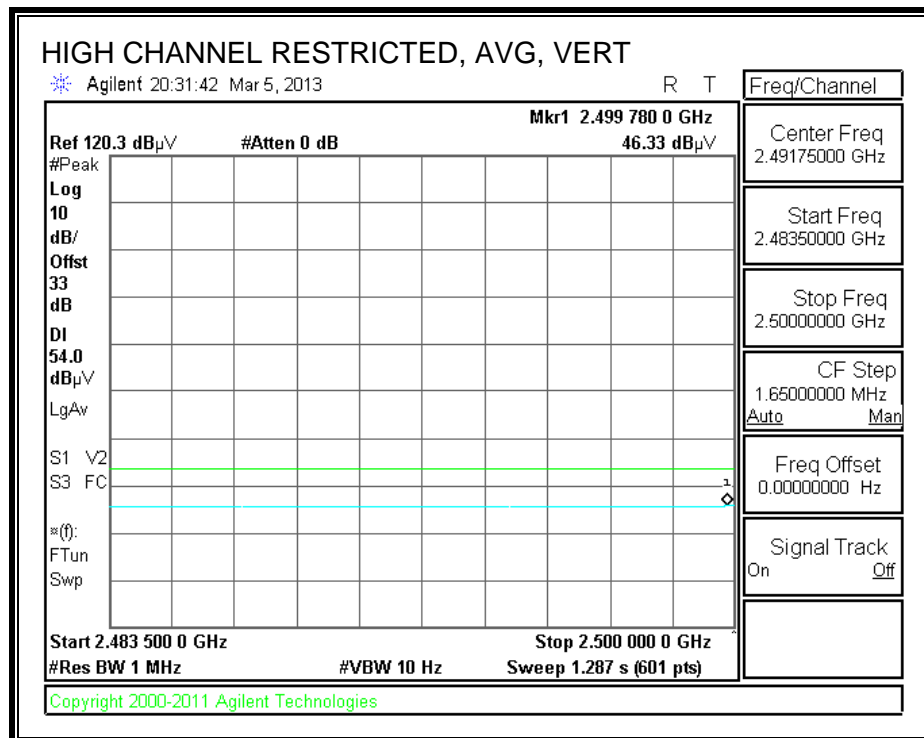
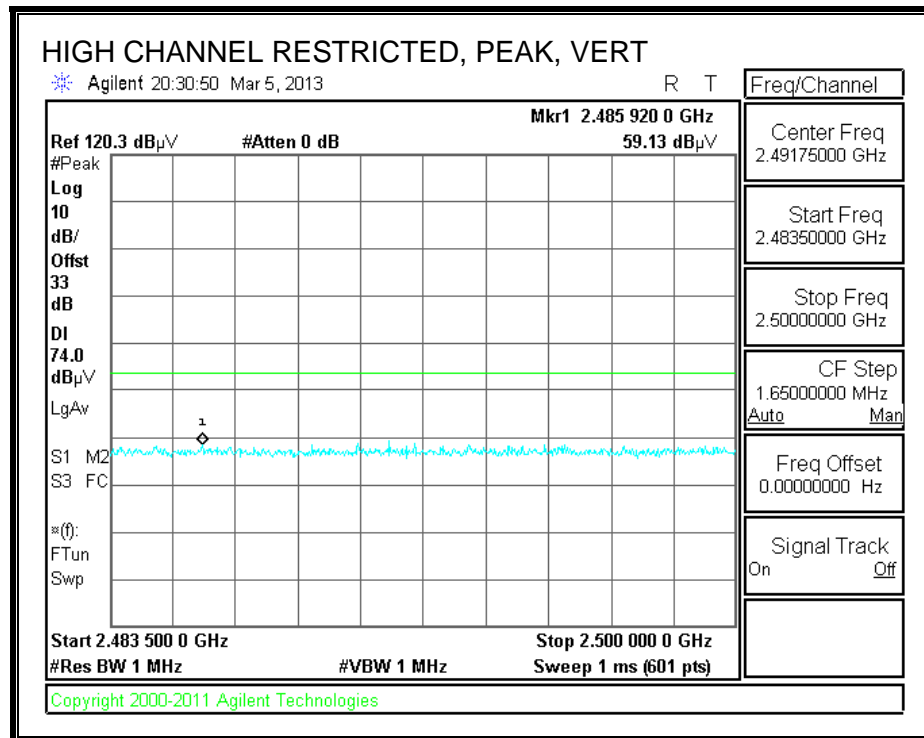
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



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



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



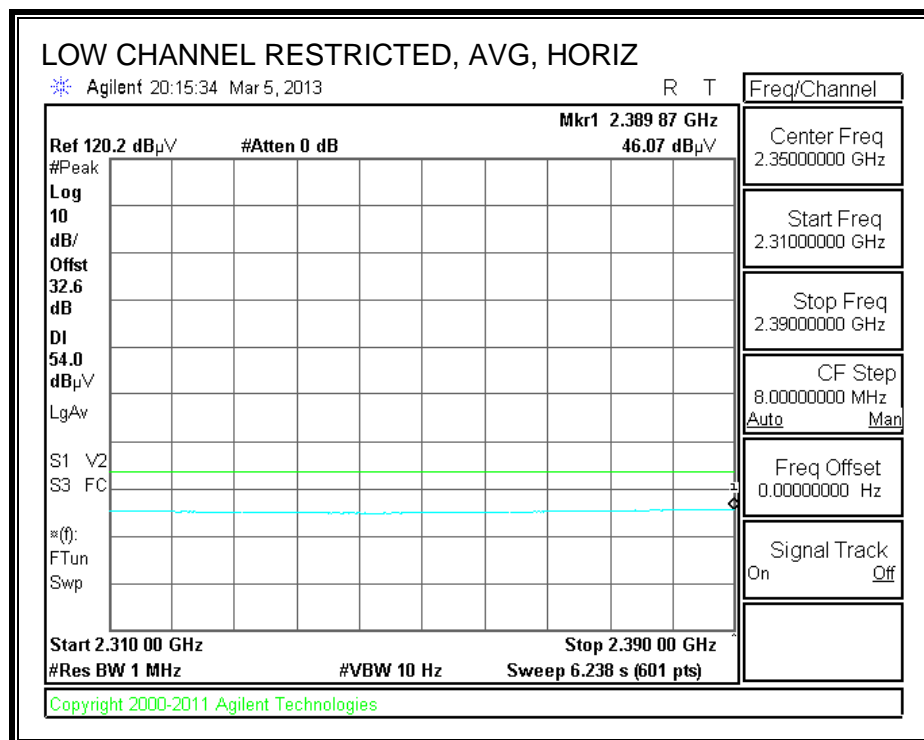
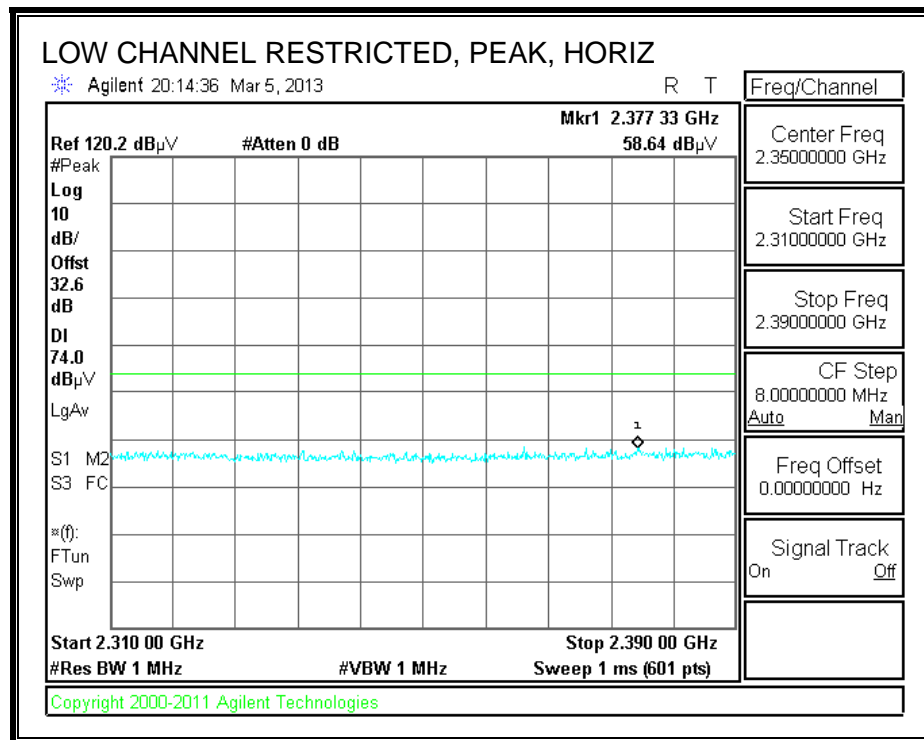


## HARMONICS AND SPURIOUS EMISSIONS

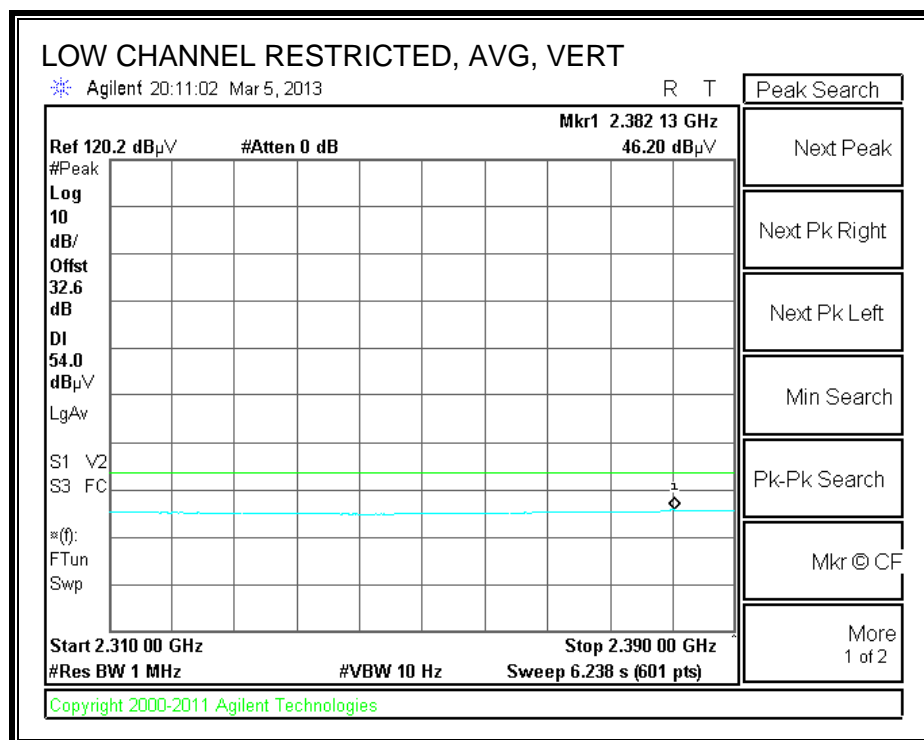
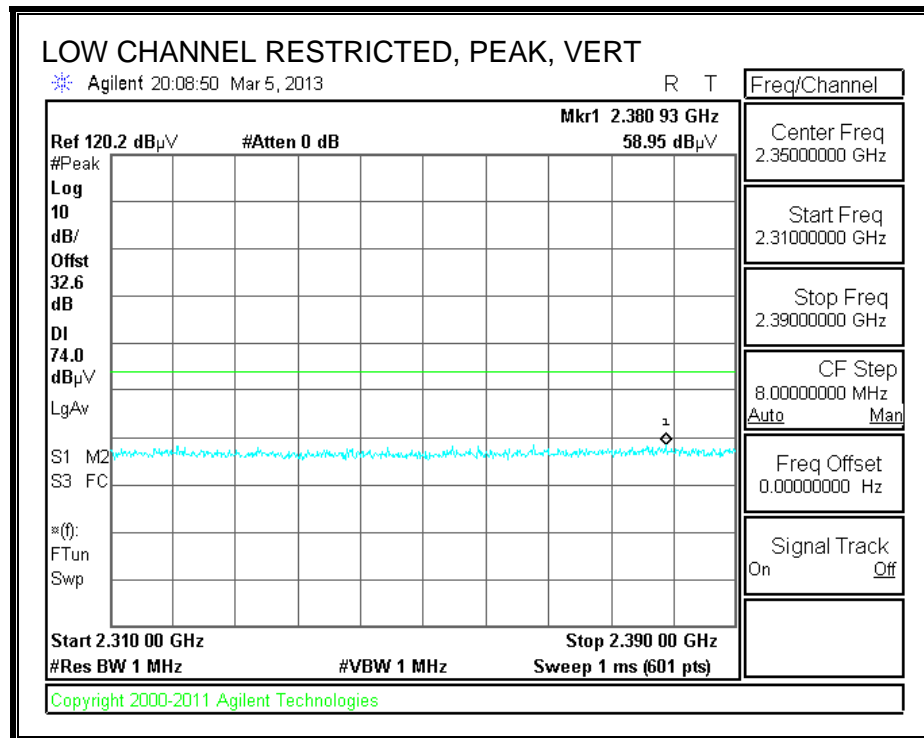
High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber-A																
Company:		Broadcom														
Project #:		13U14796														
Date:		3/1/2013														
Test Engineer:		Tony Wagoner														
Configuration:		Tx Continuously														
Mode:		Bluetooth GFSK														
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T73; S/N: 6717 @3m			T144 Miteq 3008A00931						T89; ARA 18-26GHz; S/N:1049			FCC 15.205				
Hi Frequency Cables																
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements RBW=VBW=1MHz	
3' cable 22807700			12' cable 22807600			20' cable 22807500						R_001			Average Measurements RBW=1MHz ; VBW=10Hz	
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	
Low channel, 2402MHz																
4.804	3.0	38.6	28.6	33.4	6.7	-35.7	0.0	0.0	43.1	33.1	74.0	54.0	-30.9	-20.9	H	
4.804	3.0	40.3	31.8	33.4	6.7	-35.7	0.0	0.0	44.8	36.3	74.0	54.0	-29.2	-17.7	V	
Mid channel, 2441MHz																
4.882	3.0	37.8	27.4	33.5	6.8	-35.7	0.0	0.0	42.5	32.1	74.0	54.0	-31.5	-21.9	H	
4.882	3.0	38.4	28.4	33.5	6.8	-35.7	0.0	0.0	43.1	33.1	74.0	54.0	-30.9	-20.9	V	
7.323	3.0	36.5	23.5	36.0	8.7	-35.8	0.0	0.0	45.3	32.3	74.0	54.0	-28.7	-21.7	H	
7.323	3.0	36.0	23.4	36.0	8.7	-35.8	0.0	0.0	44.9	32.3	74.0	54.0	-29.1	-21.7	V	
High channel, 2480MHz																
4.960	3.0	38.1	28.5	33.6	6.9	-35.6	0.0	0.0	42.9	33.3	74.0	54.0	-31.1	-20.7	H	
4.960	3.0	39.8	32.5	33.6	6.9	-35.6	0.0	0.0	44.6	37.3	74.0	54.0	-29.4	-16.7	V	
7.440	3.0	36.6	23.6	36.1	8.8	-35.8	0.0	0.0	45.6	32.7	74.0	54.0	-28.4	-21.3	H	
7.440	3.0	36.4	23.6	36.1	8.8	-35.8	0.0	0.0	45.5	32.7	74.0	54.0	-28.5	-21.3	V	
H																
Rev. 01.30.13																
f	Measurement Frequency					Amp	Preamp Gain					Avg Lim	Average Field Strength Limit			
Dist	Distance to Antenna					D Corr	Distance Correct to 3 meters					Pk Lim	Peak Field Strength Limit			
Read	Analyzer Reading					Avg	Average Field Strength @ 3 m					Avg Mar	Margin vs. Average Limit			
AF	Antenna Factor					Peak	Calculated Peak Field Strength					Pk Mar	Margin vs. Peak Limit			
CL	Cable Loss					HPF	High Pass Filter									

## 8.2.2. ENHANCED DATA RATE 8PSK MODULATION

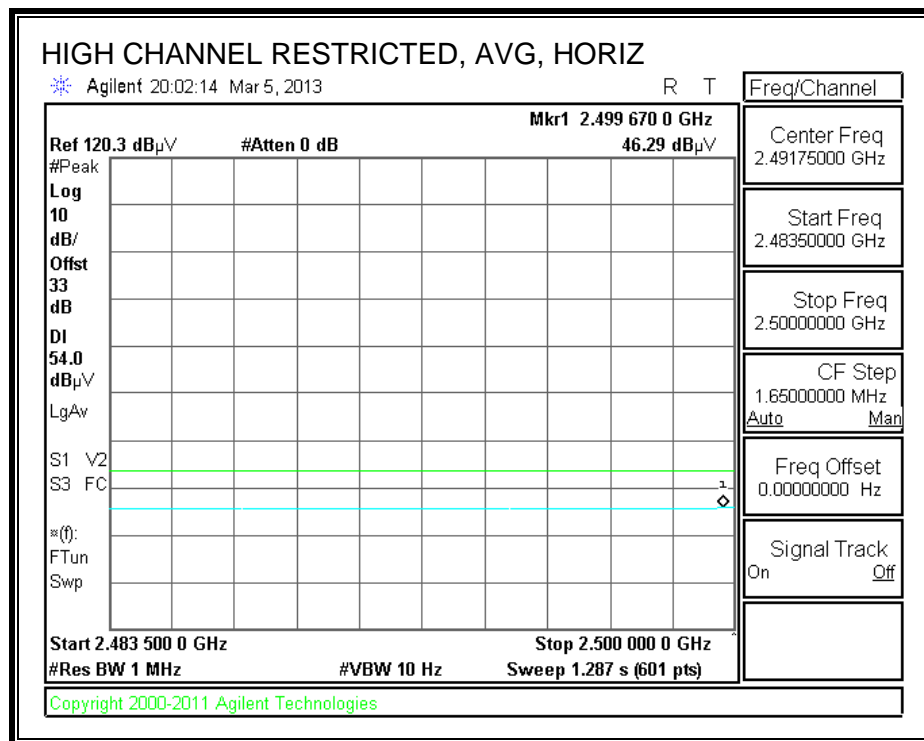
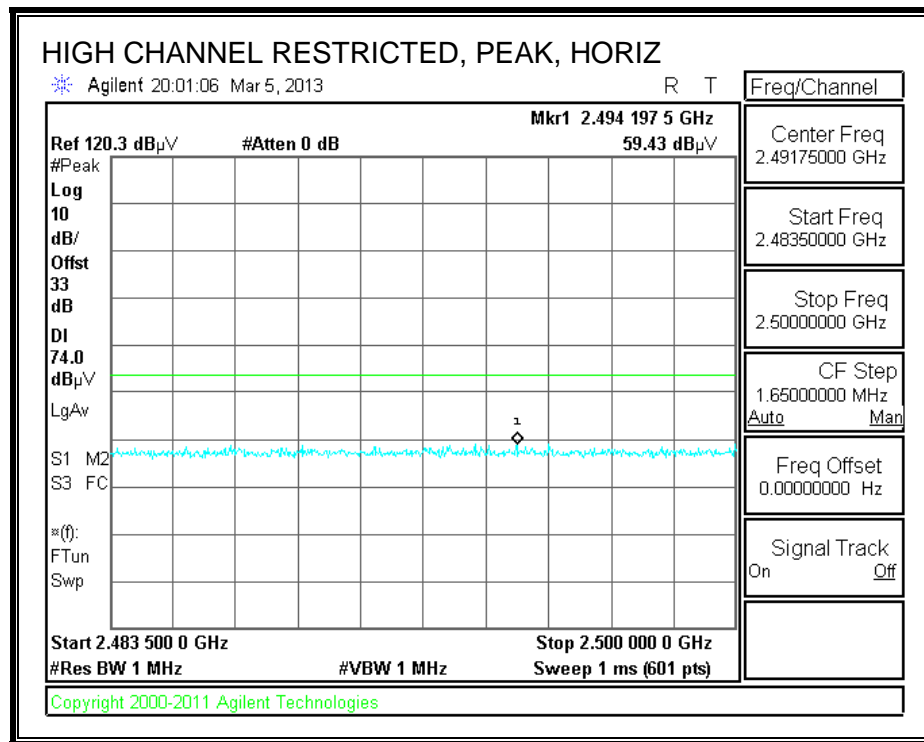
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



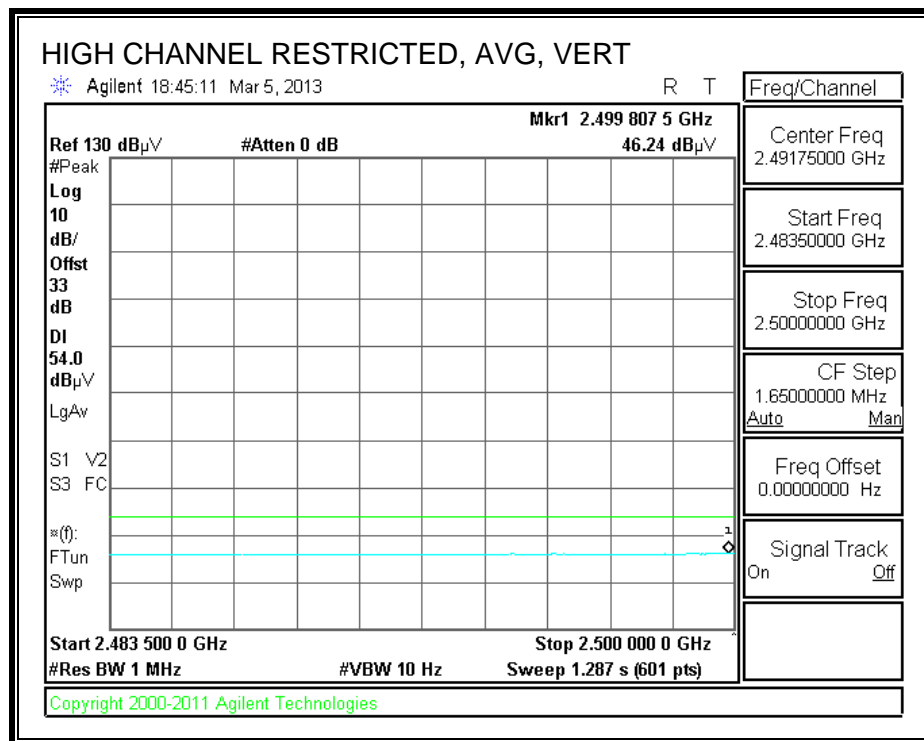
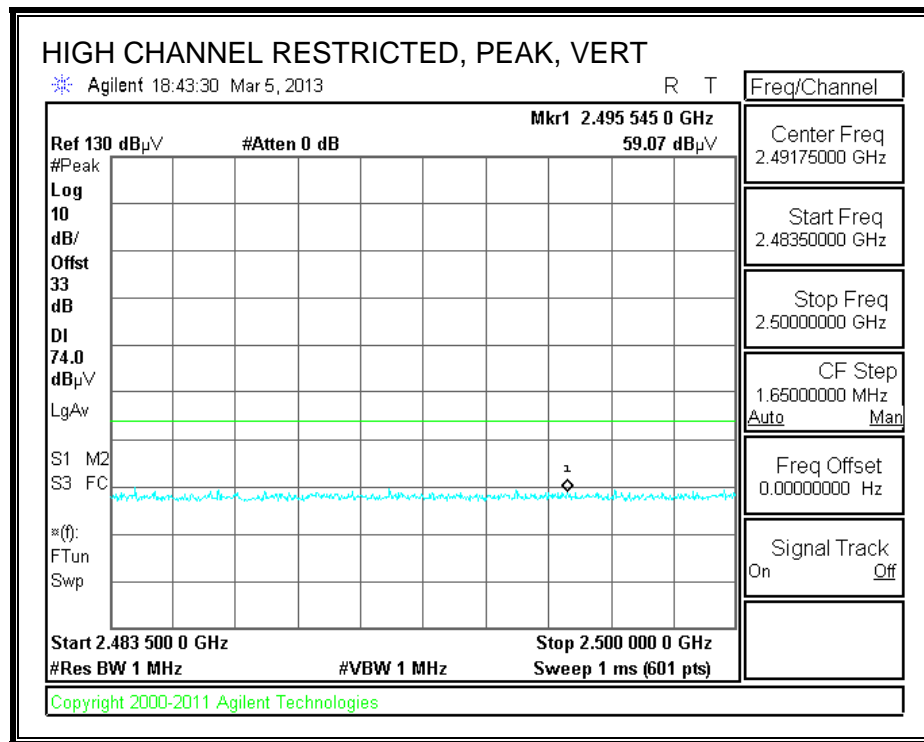
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



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



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

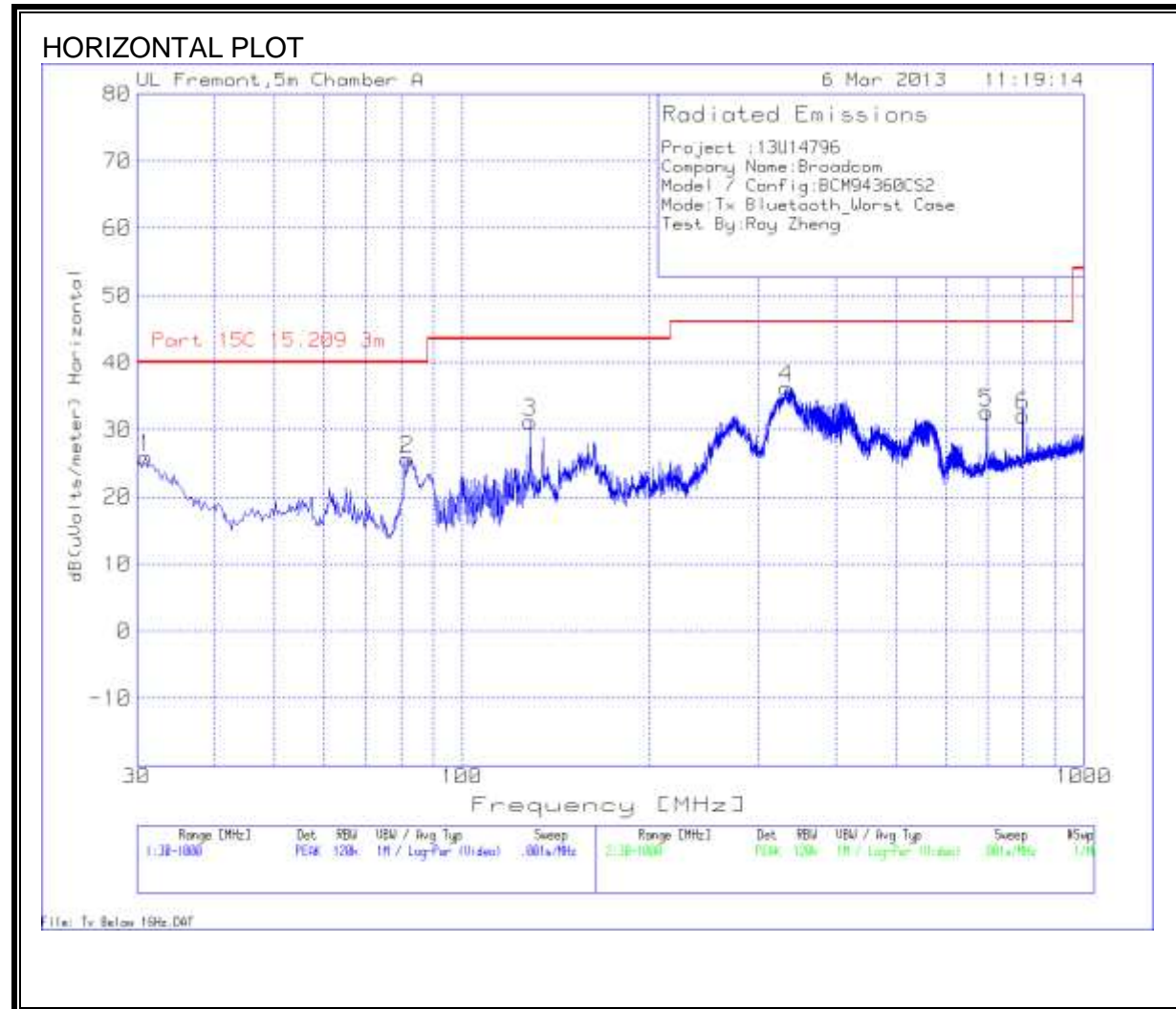


## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber-A																	
Company:		Broadcom															
Project #:		13U14796															
Date:		3/4/2013															
Test Engineer:		Roy Zheng															
Configuration:		Tx Continuously															
Mode:		Bluetooth 8PSK															
Test Equipment:																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz				Limit	
T73; S/N: 6717 @3m				T144 Miteq 3008A00931								T89; ARA 18-26GHz; S/N:1049				FCC 15.205	
Hi Frequency Cables																	
3' cable 22807700				12' cable 22807600				20' cable 22807500				HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz	
3' cable 22807700				12' cable 22807600				20' cable 22807500									
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)		
Low channel, 2402MHz																	
4.804	3.0	39.3	27.7	33.4	6.7	-35.7	0.0	0.0	43.8	32.2	74.0	54.0	-30.2	-21.8	V		
4.804	3.0	40.5	27.3	33.4	6.7	-35.7	0.0	0.0	45.0	31.8	74.0	54.0	-29.0	-22.2	H		
Mid channel, 2441MHz																	
4.882	3.0	39.8	27.6	33.5	6.8	-35.7	0.0	0.0	44.5	32.3	74.0	54.0	-29.5	-21.7	V		
4.882	3.0	38.8	27.0	33.5	6.8	-35.7	0.0	0.0	43.5	31.7	74.0	54.0	-30.5	-22.3	H		
7.323	3.0	40.7	28.1	36.0	8.7	-35.8	0.0	0.0	49.6	36.9	74.0	54.0	-24.4	-17.1	V		
7.323	3.0	40.3	28.1	36.0	8.7	-35.8	0.0	0.0	49.2	36.9	74.0	54.0	-24.8	-17.1	H		
High channel, 2480MHz																	
4.960	3.0	39.4	28.1	33.6	6.9	-35.6	0.0	0.0	44.2	32.9	74.0	54.0	-29.8	-21.1	V		
4.960	3.0	39.3	27.1	33.6	6.9	-35.6	0.0	0.0	44.1	31.9	74.0	54.0	-29.9	-22.1	H		
7.440	3.0	39.5	27.7	36.1	8.8	-35.8	0.0	0.0	48.6	36.8	74.0	54.0	-25.4	-17.2	V		
7.440	3.0	39.7	27.7	36.1	8.8	-35.8	0.0	0.0	48.8	36.8	74.0	54.0	-25.2	-17.2	H		
Rev. 01.30.13																	
f	Measurement Frequency					Amp	Preamp Gain					Avg Lim	Average Field Strength Limit				
Dist	Distance to Antenna					D Corr	Distance Correct to 3 meters					Pk Lim	Peak Field Strength Limit				
Read	Analyzer Reading					Avg	Average Field Strength @ 3 m					Avg Mar	Margin vs. Average Limit				
AF	Antenna Factor					Peak	Calculated Peak Field Strength					Pk Mar	Margin vs. Peak Limit				
CL	Cable Loss					HPF	High Pass Filter										

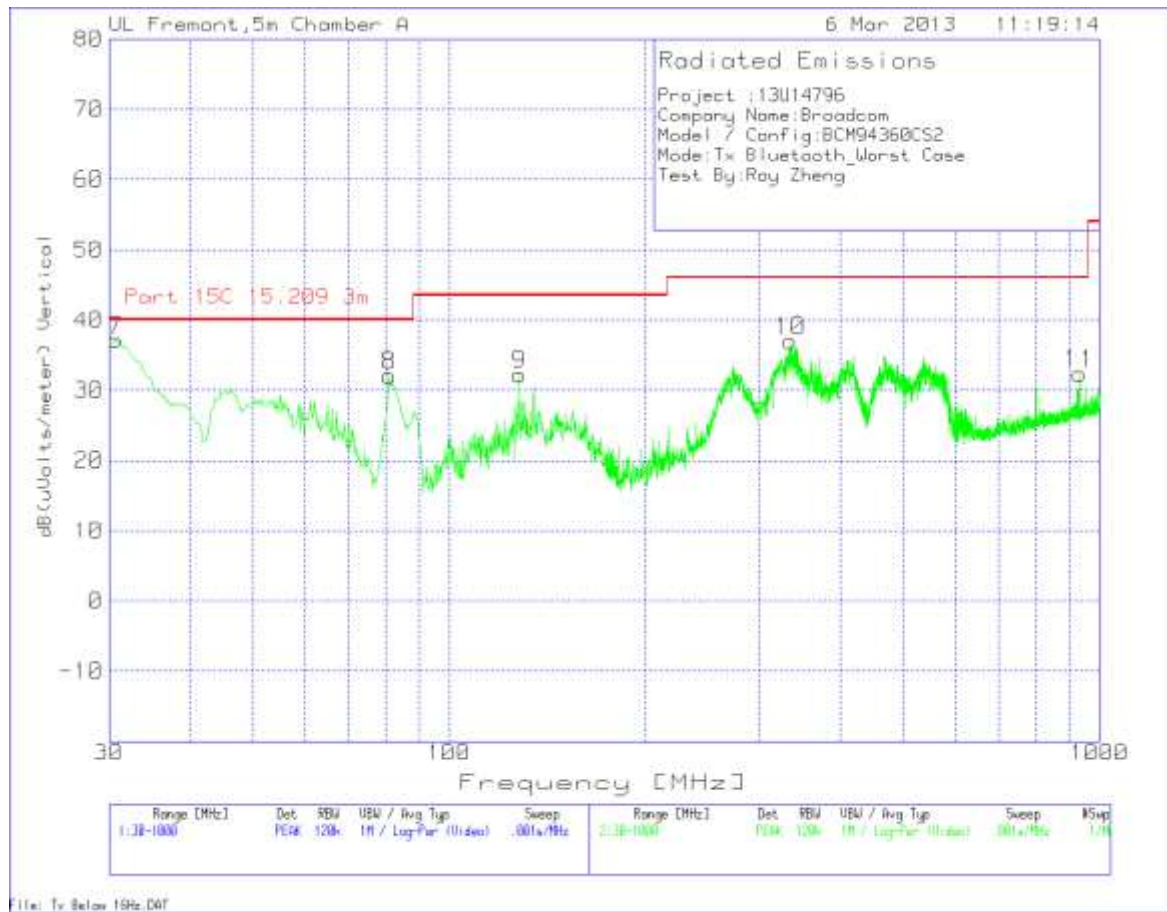
### 8.3. WORST-CASE BELOW 1 GHz

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



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

**VERTICAL PLOT**





# HORIZONTAL AND VERTICAL DATA

Project :13U14796										
Company Name:Broadcom										
Model / Config:BCM94360CS2										
Mode:Tx Bluetooth_Worst Case										
Test By:Roy Zheng										
Horizontal 30 - 1000MHz										
Marker No.	Test Frequency	Meter Reading	Detector	T185 Antenna Factor (dB)	T64 preamp/ cable loss loop (dB)	dB(uVolts /meter)	Part 15C 15.209 3m	Margin	Height [cm]	Polarity
1	30.9693	33.08	PK	20.5	-27.7	25.88	40.0	-14.12	400	Horz
2	81.8561	45.28	PK	7.5	-27.1	25.68	40.0	-14.32	200	Horz
3	128.8659	43.86	PK	14.1	-26.8	31.16	43.5	-12.34	200	Horz
4	332.6555	47.90	PK	13.9	-25.6	36.20	46.0	-9.80	100	Horz
5	697.1022	35.65	PK	20.1	-23.1	32.65	46.0	-13.35	100	Horz
6	799.6028	34.07	PK	21.0	-23.0	32.07	46.0	-13.93	100	Horz
Vertical 30 - 1000MHz										
Marker No.	Test Frequency	Meter Reading	Detector	T185 Antenna Factor (dB)	T64 preamp/ cable loss loop (dB)	dB(uVolts /meter)	Part 15C 15.209 3m	Margin	Height [cm]	Polarity
7	30.727	44.25	PK	20.6	-27.7	37.15	40.0	-2.85	100	Vert
8	80.8868	51.61	PK	7.6	-27.1	32.11	40.0	-7.89	100	Vert
9	128.1389	44.98	PK	14.2	-26.9	32.28	43.5	-11.22	100	Vert
10	334.8364	48.87	PK	13.9	-25.7	37.07	46.0	-8.93	100	Vert
11	932.1509	32.84	PK	22.3	-22.8	32.34	46.0	-13.66	200	Vert
PK - Peak detector										
Text File: Tx Below 1GHz.TXT										

## 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 <sup>*</sup>	56 to 46 <sup>*</sup>
0.5-5	56	46
5-30	60	50

<sup>\*</sup> 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.

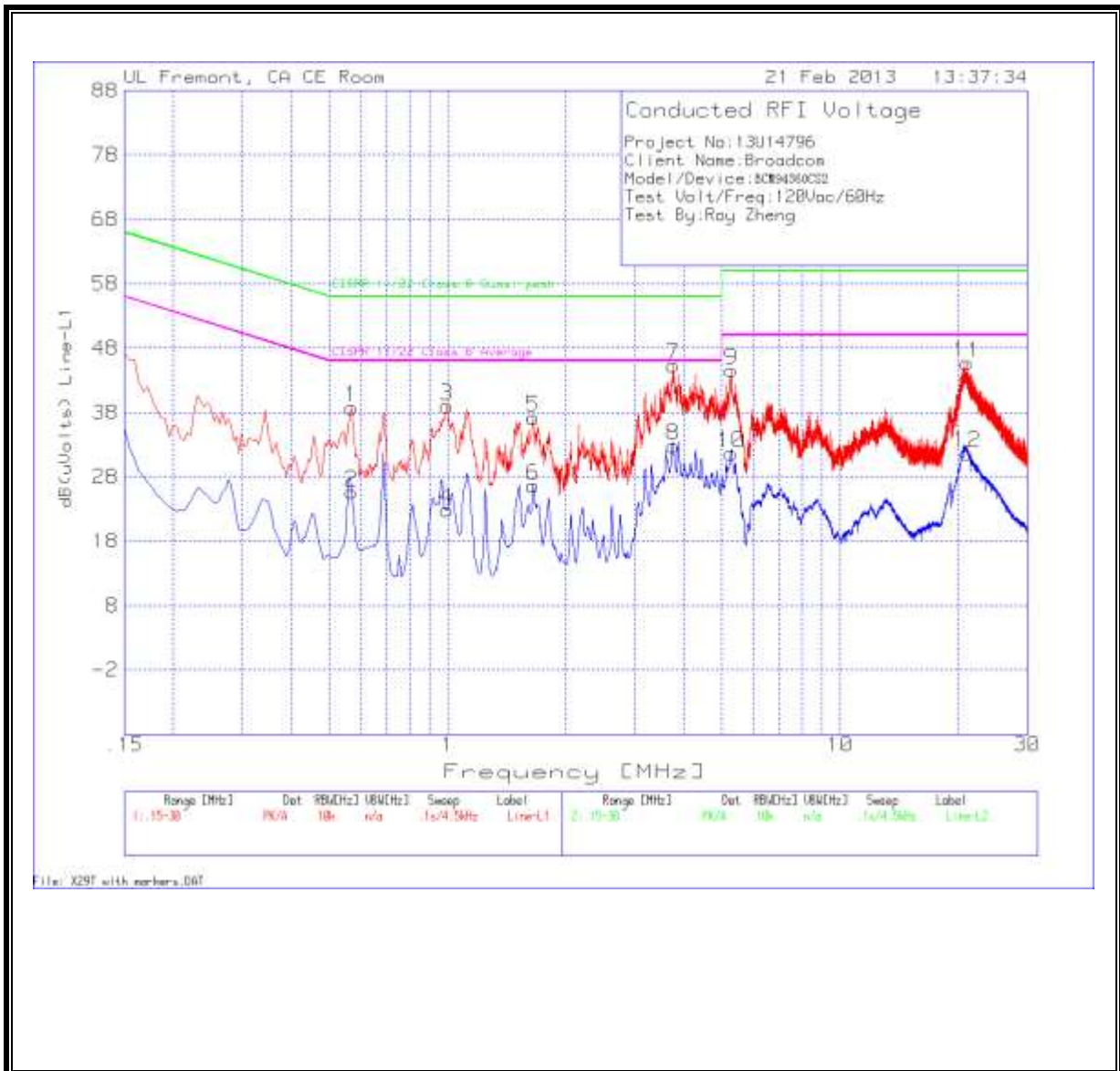
Line conducted data is recorded for both NEUTRAL and HOT lines.

## RESULTS

### 6 WORST EMISSIONS

<b>Project No:</b>		13U14796							
<b>Client Name:</b>		Broadcom							
<b>Model/Device:</b>		BCM94360CS2							
<b>Test Volt/Freq:</b>		120Vac/60Hz							
<b>Test By:</b>		Roy Zheng							
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
Line-L1 .15 - 30MHz									
0.5685	38.63	PK	0.1	0	38.73	56	-17.27	-	-
0.5685	25.56	Av	0.1	0	25.66	-	-	46	-20.34
0.996	38.93	PK	0.1	0	39.03	56	-16.97	-	-
0.996	22.83	Av	0.1	0	22.93	-	-	46	-23.07
1.65525	37.04	PK	0.1	0.1	37.24	56	-18.76	-	-
1.65525	26.48	Av	0.1	0.1	26.68	-	-	46	-19.32
3.7545	45.13	PK	0.1	0.1	45.33	56	-10.67	-	-
3.7545	32.58	Av	0.1	0.1	32.78	-	-	46	-13.22
5.298	44.41	PK	0.1	0.1	44.61	60	-15.39	-	-
5.298	31.5	Av	0.1	0.1	31.7	-	-	50	-18.3
21.0615	45.15	PK	0.3	0.2	45.65	60	-14.35	-	-
21.0615	31.2	Av	0.3	0.2	31.7	-	-	50	-18.3
Line-L2 .15 - 30MHz									
0.402	42.88	PK	0.1	0	42.98	57.8	-14.82	-	-
0.402	27.73	Av	0.1	0	27.83	-	-	47.8	-19.97
0.636	40.36	PK	0.1	0	40.46	56	-15.54	-	-
0.636	29.43	Av	0.1	0	29.53	-	-	46	-16.47
1.2165	40.42	PK	0.1	0.1	40.62	56	-15.38	-	-
1.2165	24.39	Av	0.1	0.1	24.59	-	-	46	-21.41
3.255	41.96	PK	0.1	0.1	42.16	56	-13.84	-	-
3.255	24.18	Av	0.1	0.1	24.38	-	-	46	-21.62
13.0065	39.14	PK	0.2	0.2	39.54	60	-20.46	-	-
13.0065	25.72	Av	0.2	0.2	26.12	-	-	50	-23.88
20.9445	43.22	PK	0.3	0.2	43.72	60	-16.28	-	-
20.9445	31.12	Av	0.3	0.2	31.62	-	-	50	-18.38
PK - Peak detector QP - Quasi-Peak detector Av - Average detector									

**LINE 1 RESULTS**



**LINE 2 RESULTS**

