



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

**CERTIFICATION TEST REPORT**

**FOR**

**BROADCOM 802.11a/b/g/n WLAN + BLUETOOTH PCI-E MINI CARD**

**MODEL NUMBER: BCM943228HMB**

**FCC ID: QDS-BRCM1058  
IC: 4324A- BRCM1058**

**REPORT NUMBER: 11U13795-16, Revision A**

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**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/23/11	Initial Issue	M. Heckrotte
A	06/27/11	Corrected the Peripheral Support Equipment List table. Updated page numbers on report	A. Zaffar

## 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 AND 99% BANDWIDTH .....	11
7.1.2. HOPPING FREQUENCY SEPARATION .....	16
7.1.3. NUMBER OF HOPPING CHANNELS.....	17
7.1.4. AVERAGE TIME OF OCCUPANCY .....	20
7.1.5. OUTPUT POWER.....	24
7.1.6. CONDUCTED SPURIOUS EMISSIONS.....	27
7.2. ENHANCED DATA RATE 8PSK MODULATION.....	32
7.2.1. 20 dB AND 99% BANDWIDTH .....	32
7.2.2. HOPPING FREQUENCY SEPARATION .....	37
7.2.3. NUMBER OF HOPPING CHANNELS.....	38
7.2.4. AVERAGE TIME OF OCCUPANCY .....	41
7.2.5. OUTPUT POWER.....	46
7.2.6. CONDUCTED SPURIOUS EMISSIONS.....	49
<b>8. RADIATED TEST RESULTS .....</b>	<b>54</b>
8.1. LIMITS AND PROCEDURE .....	54
8.2. TRANSMITTER ABOVE 1 GHz .....	55
8.2.1. BASIC DATA RATE GFSK MODULATION.....	55
8.2.2. ENHANCED DATA RATE 8PSK MODULATION .....	60
8.1. WORST-CASE RECEIVER ABOVE 1 GHz .....	65

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8.2. WORST-CASE BELOW 1 GHz .....	66
9. AC POWER LINE CONDUCTED EMISSIONS .....	69
10. SETUP PHOTOS .....	73

## 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** Broadcom 802.11a/b/g/n WLAN + Bluetooth PCI-E Mini Card

**MODEL:** BCM943228HMB

**SERIAL NUMBER:** 1403512 (P305)

**DATE TESTED:** JUNE 21 - 22, 2011

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

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:



MICHAEL HECKROTTE  
DIRECTOR OF ENGINEERING  
UL CCS



TOM CHEN  
EMC ENGINEER  
UL CCS

## 2. TEST METHODOLOGY

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

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

### 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 an 802.11a/b/g/n WLAN + Bluetooth PCI-E Mini 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	1.19	1.32
2402-2480	Enhanced QPSK	4.63	2.90

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an 802.11bgn WLAN and Bluetooth antenna with a maximum gain of 3.90 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom Bluetooth Version 5.1.0.1400

The test utility software used during testing was Bluetool, ver. 1.4.2.6.

### 5.5. WORST-CASE CONFIGURATION AND MODE

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

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	4446-38U	R8-CAD03	DoC
AC Adapter	Lenovo	ADP-65YB	11S42T4458Z1F4K96B09D	DoC
Adapter Board	Broadcom	Broadcom	N/A	N/A

### I/O CABLES

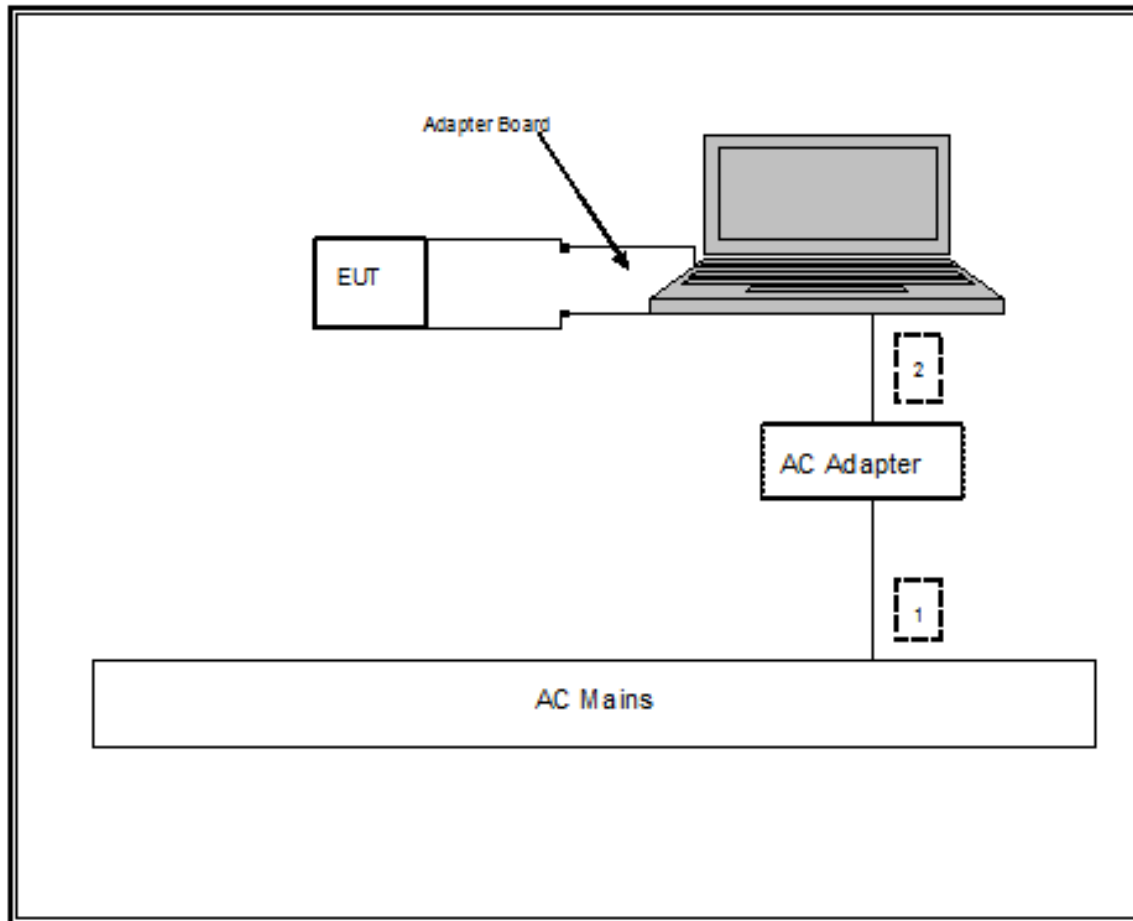
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Shielded	1.5m	NA
2	DC	1	DC	Un-shielded	1.5m	Ferrite at laptop's end

### TEST SETUP

The EUT was attached to a jig board which was installed in the PCMCIA slot of 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 Due
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	10/29/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00872	07/29/11
Antenna, Horn, 26.5 GHz	ARA	MVH-1826/B	C00980	07/29/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00778	01/26/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	08/04/11
Peak Power Meter	Agilent / HP	E9327A	C00964	12/04/11
Peak Power Sensor	Agilent / HP	E4416A	C00963	12/04/11
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRV50702	N02685	CNR
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	05/06/12
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/12

## 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.

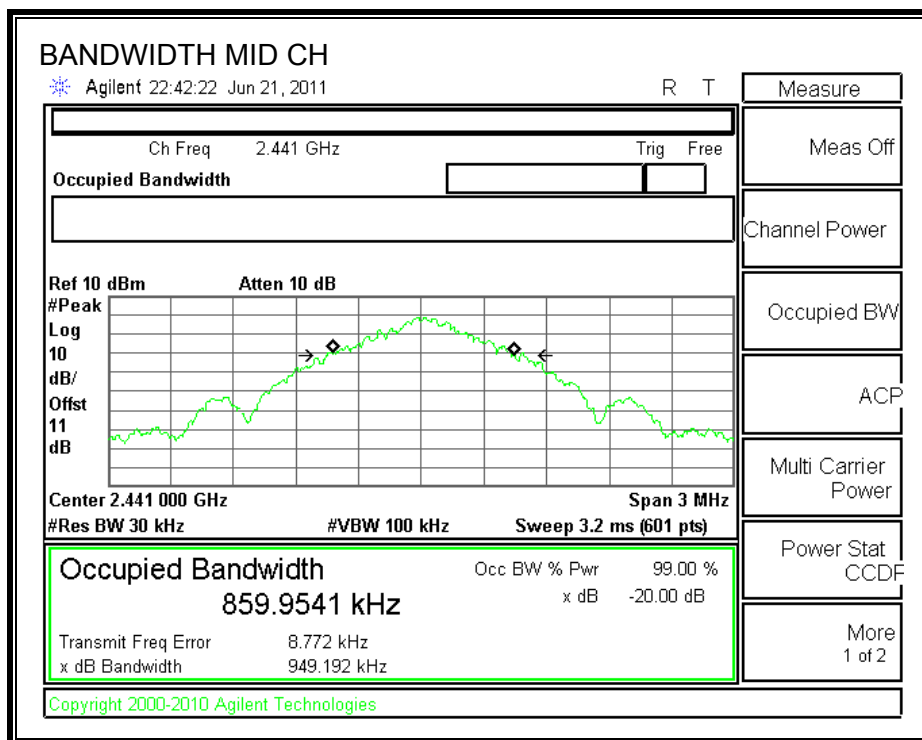
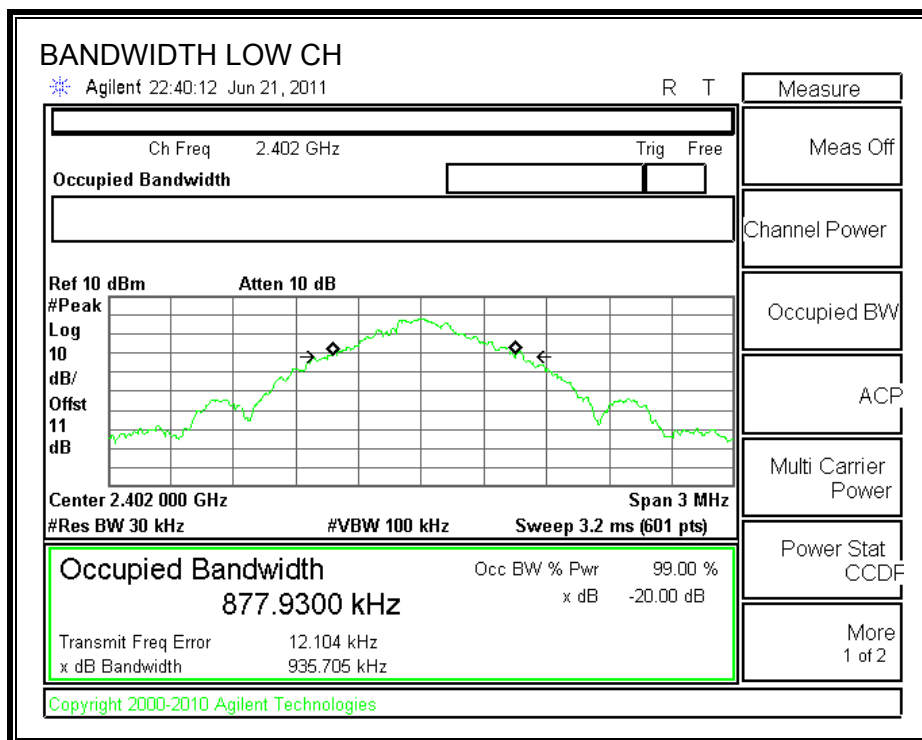
##### TEST PROCEDURE

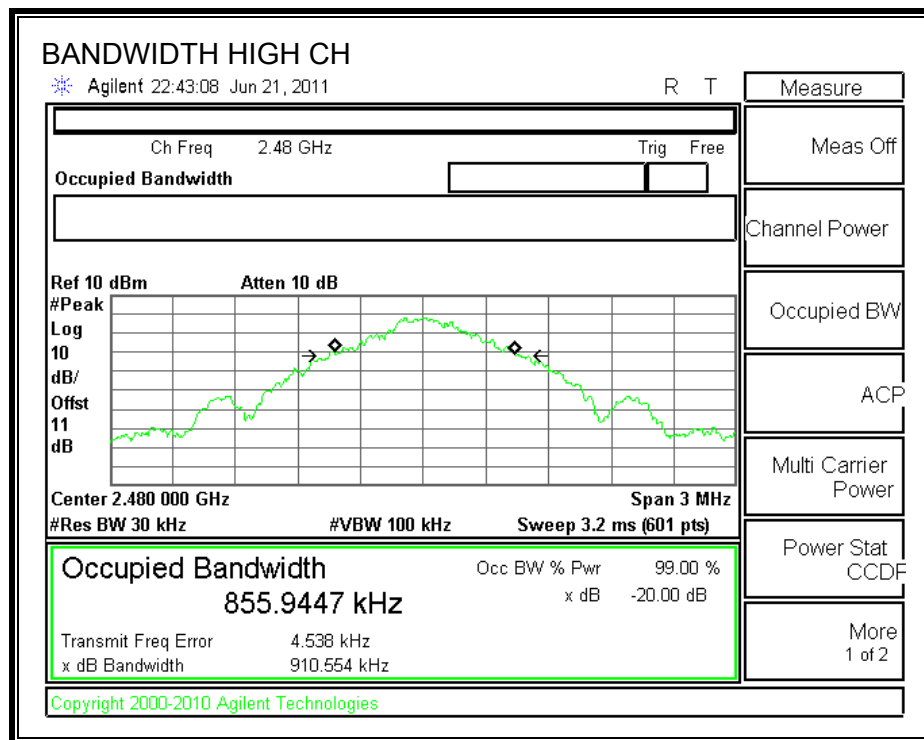
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

##### RESULTS

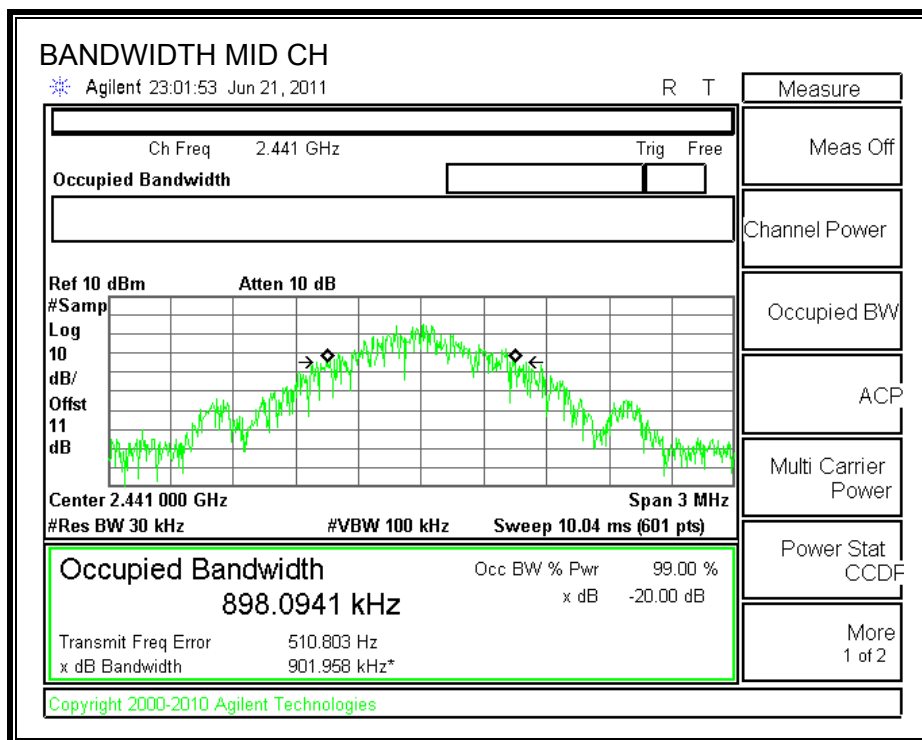
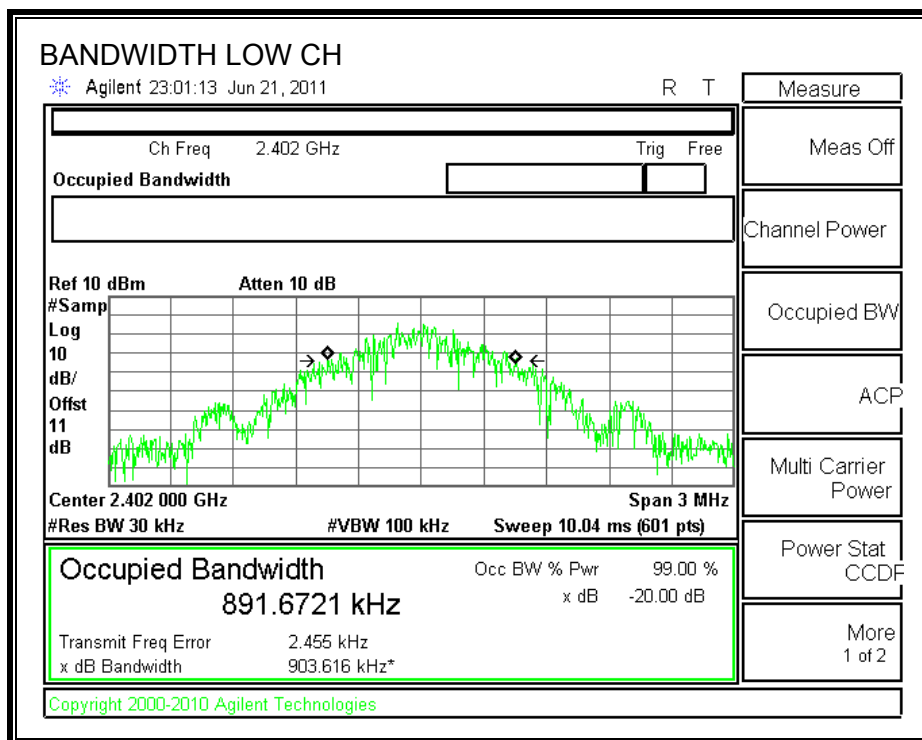
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	935.705	891.6721
Middle	2441	949.192	898.0941
High	2480	910.554	860.4283

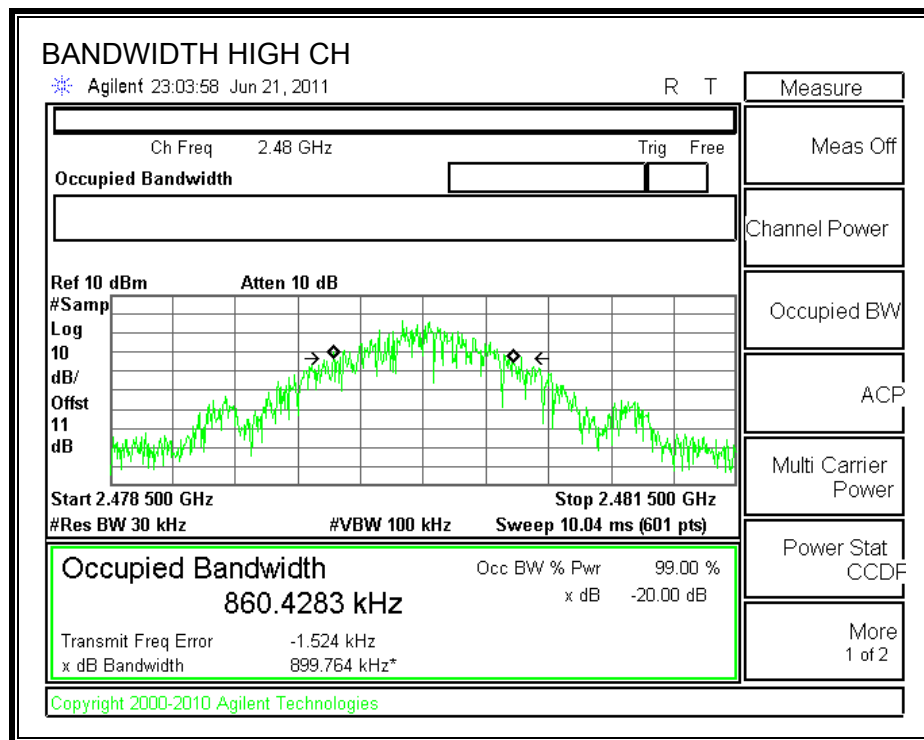
## 20 dB BANDWIDTH





**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.

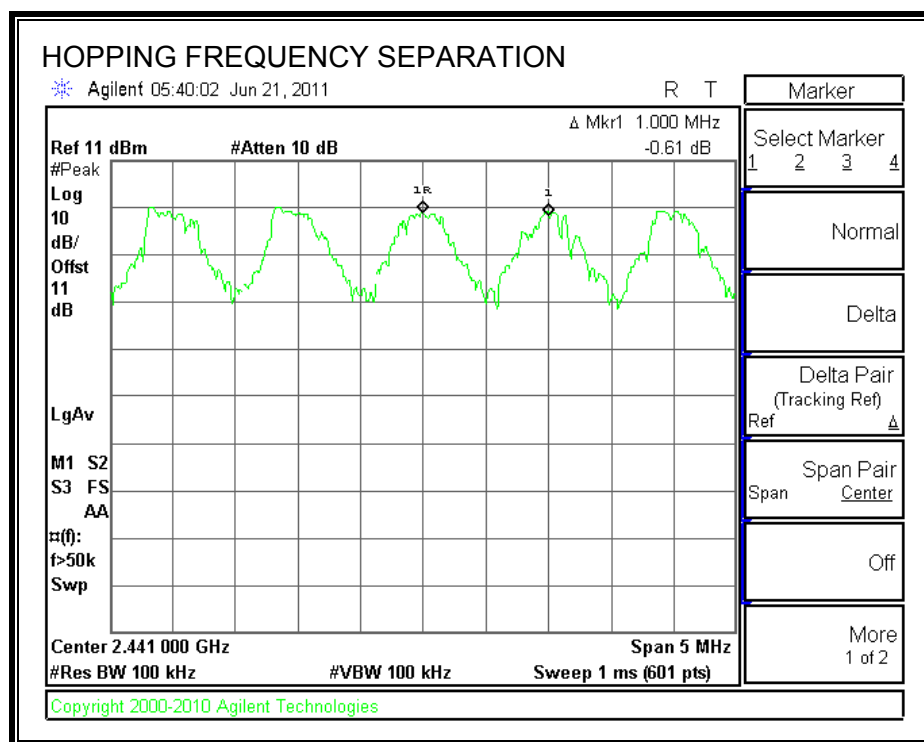
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

### TEST PROCEDURE

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

### RESULTS

#### HOPPING FREQUENCY SEPARATION





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

#### **LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

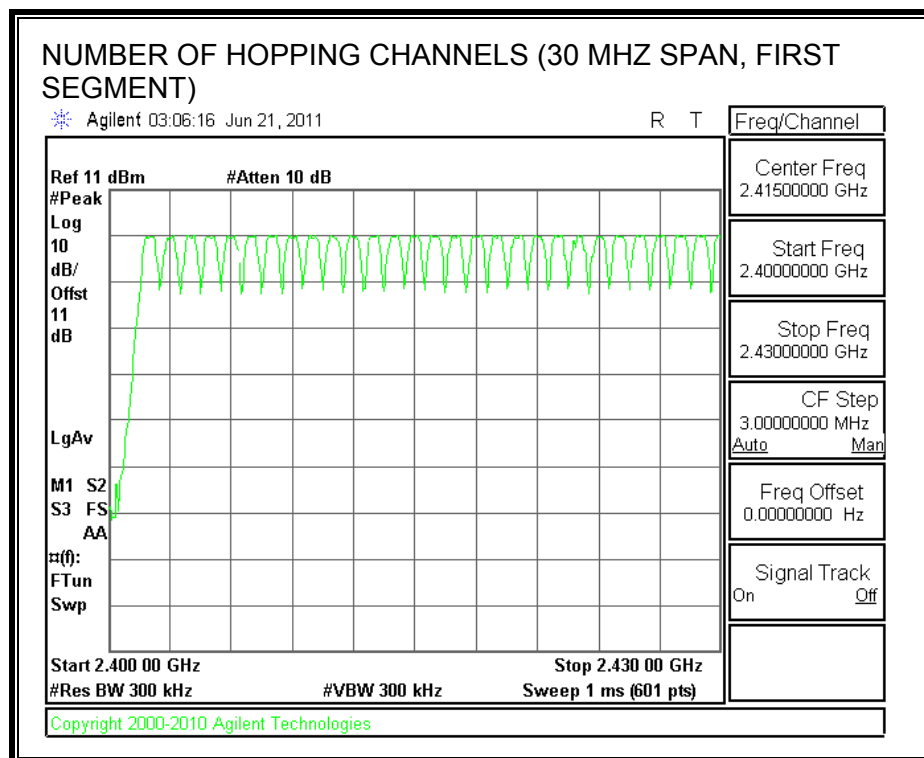
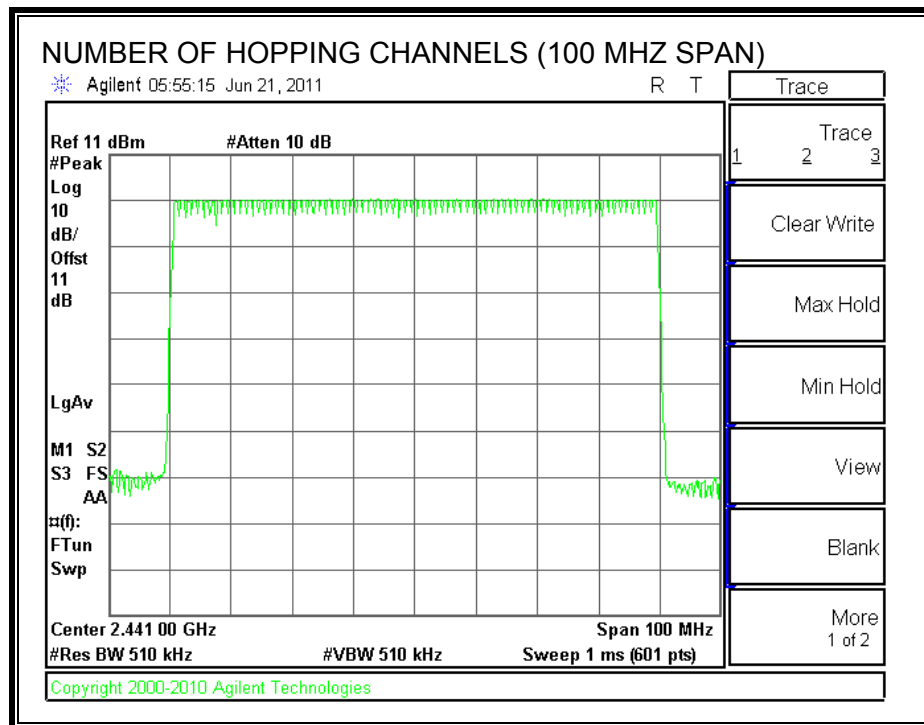
#### **TEST PROCEDURE**

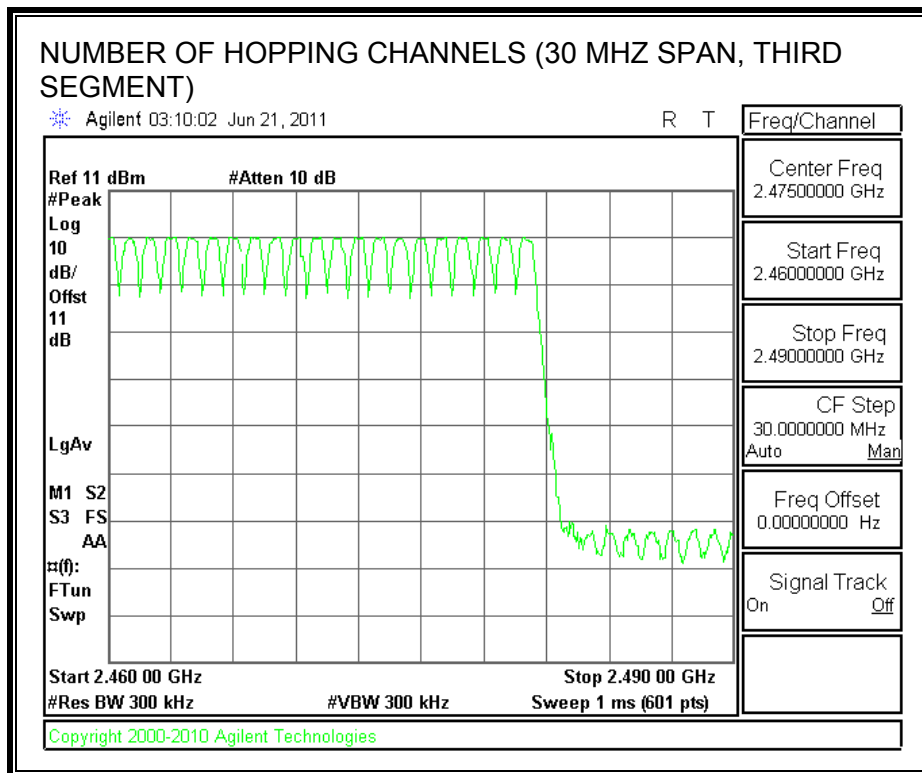
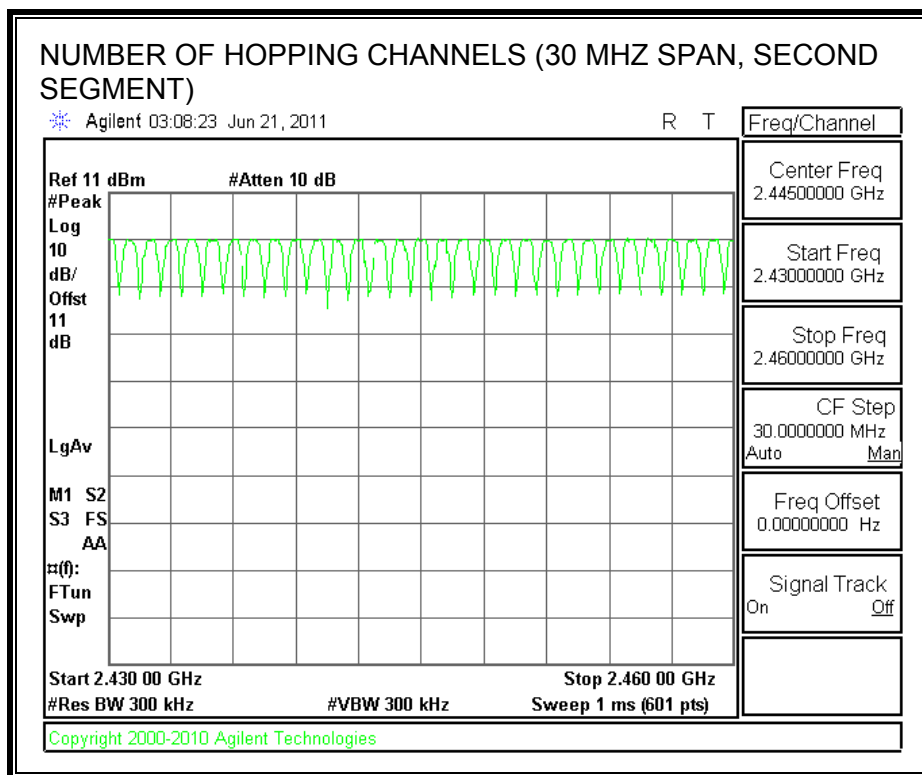
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

#### **RESULTS**

79 Channels observed.

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

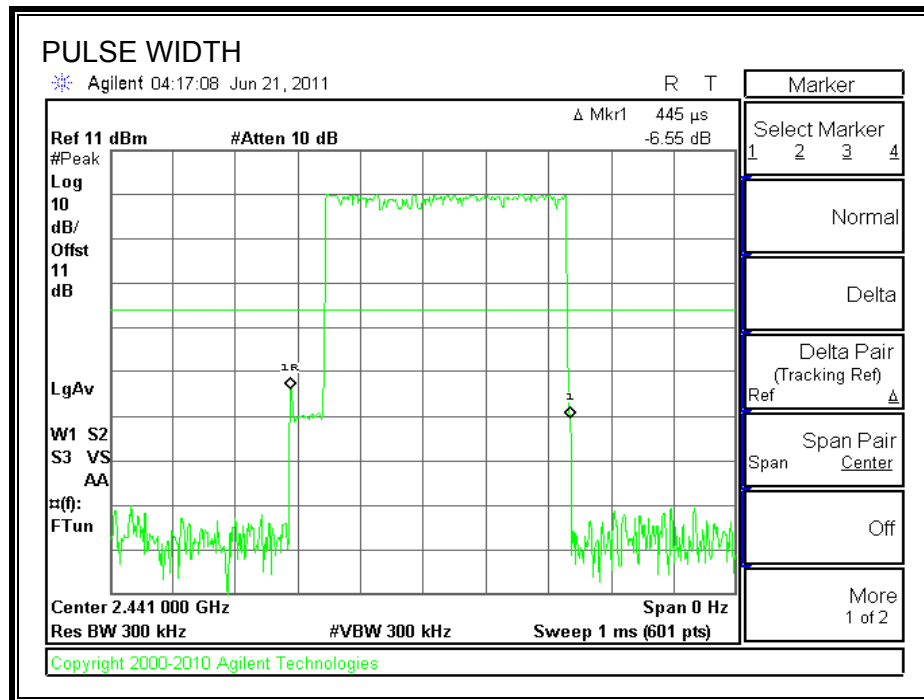
##### RESULTS

###### GFSK Mode

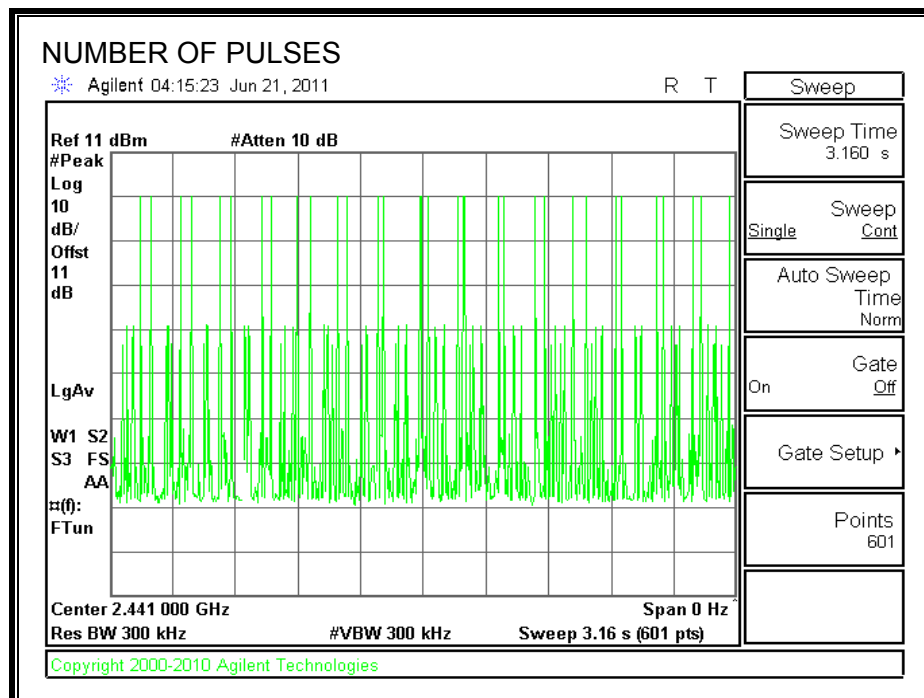
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)
DH1	0.445	31	0.138	0.4
DH3	1.707	16	0.273	0.4
DH5	2.95	11	0.325	0.4

## DH1

### PULSE WIDTH

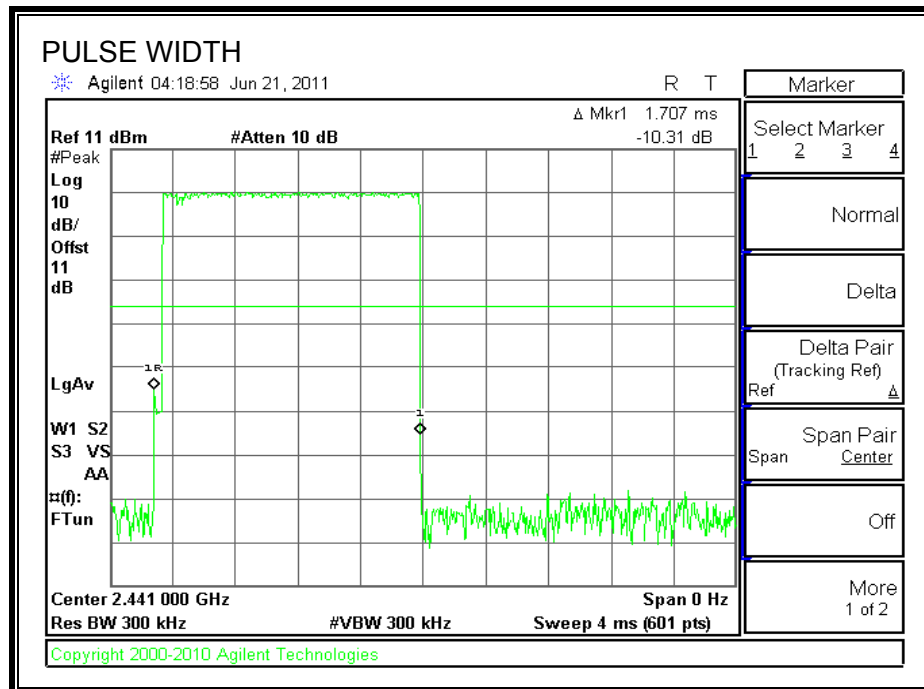


### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

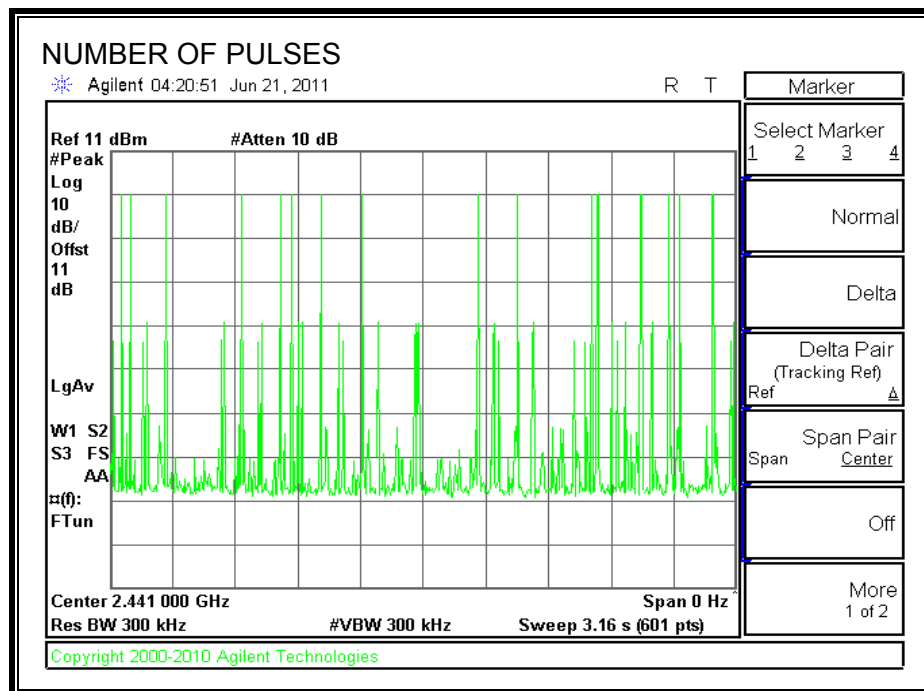


**DH3**

**PULSE WIDTH**

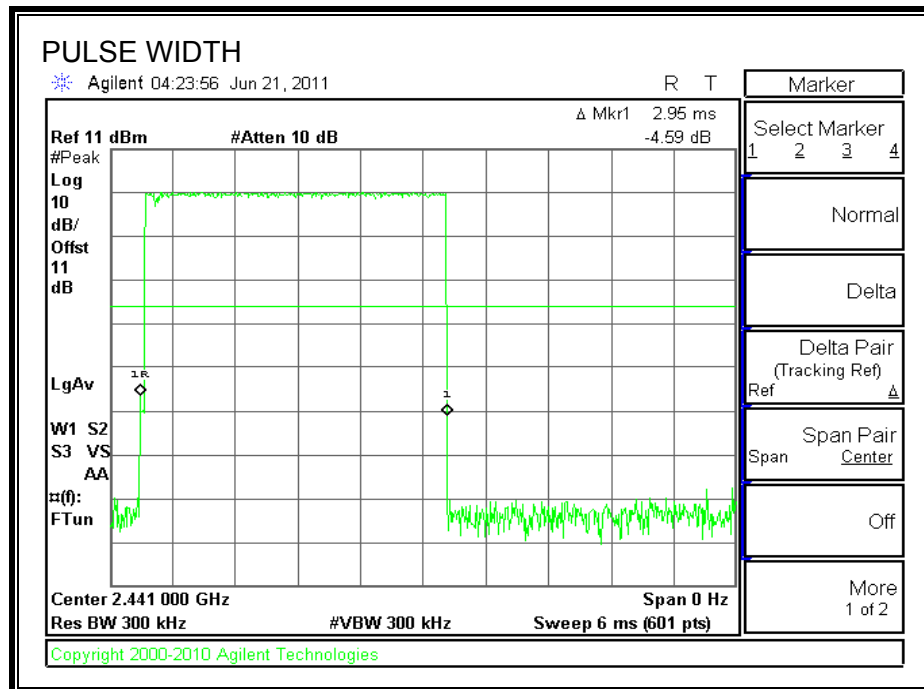


**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

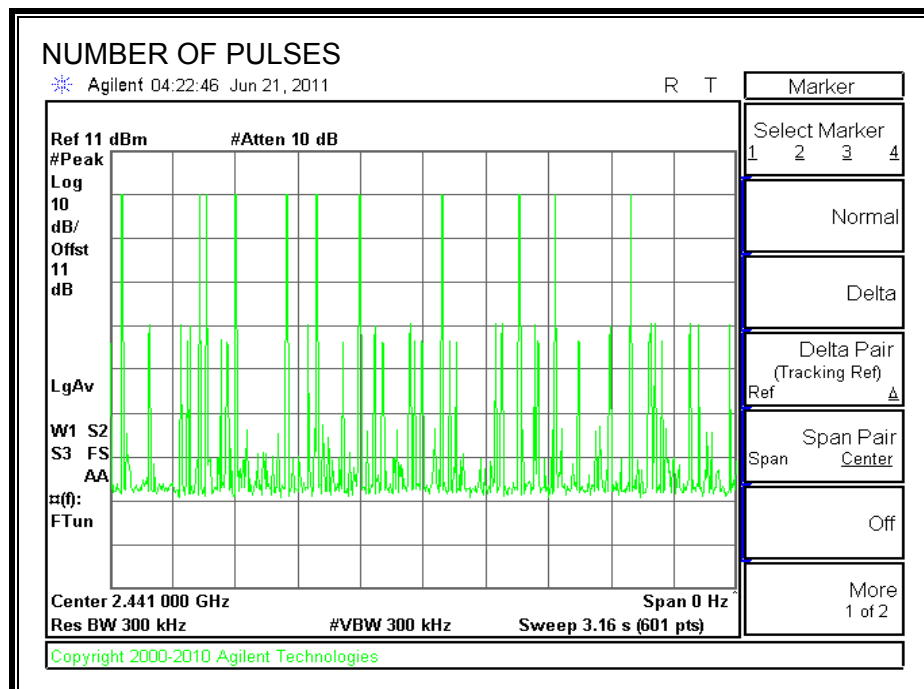


## DH5

### PULSE WIDTH



### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



### 7.1.5. OUTPUT POWER

#### LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

#### TEST PROCEDURE

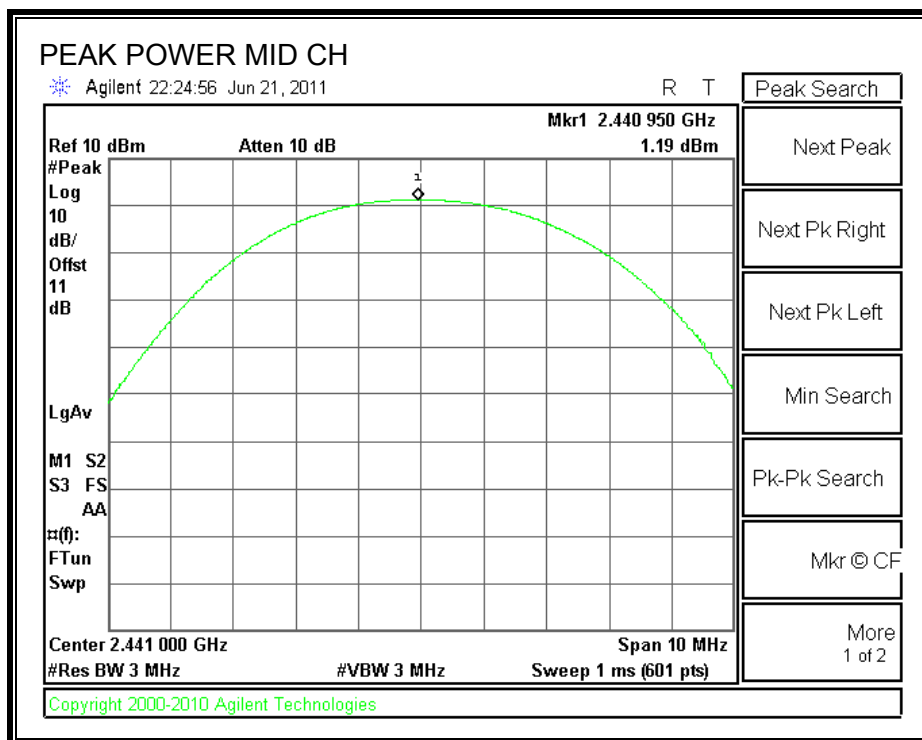
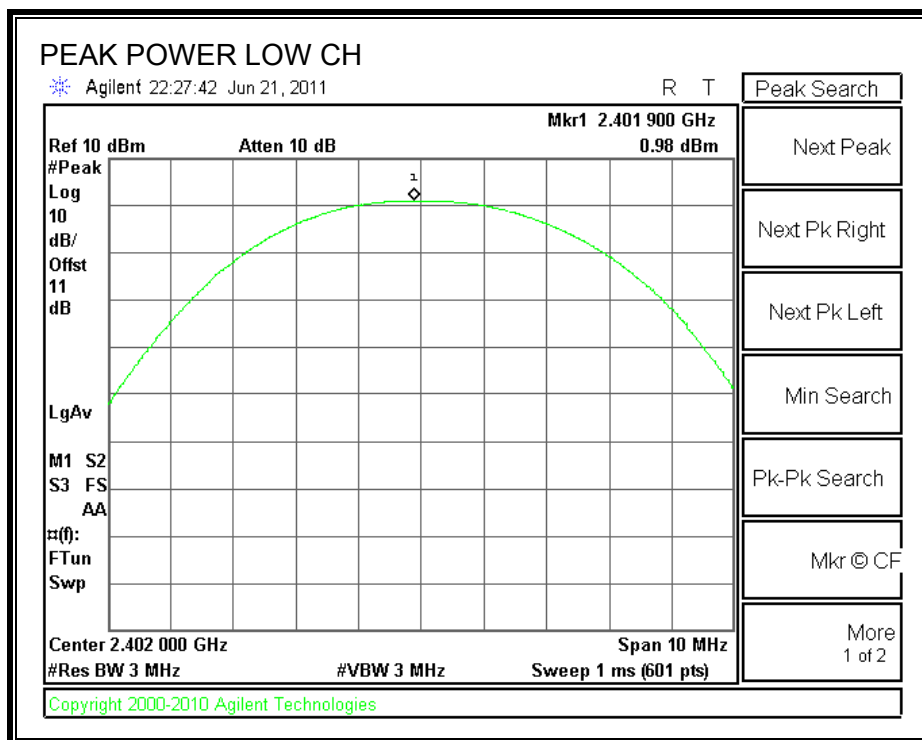
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

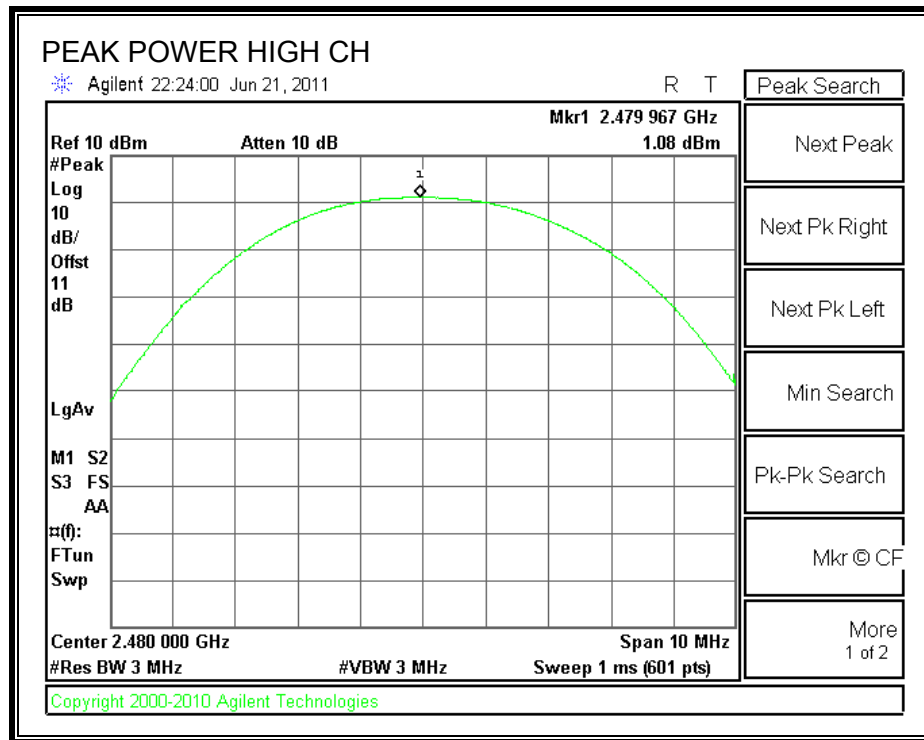
#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	0.98	30	-29.02
Middle	2441	1.19	30	-28.81
High	2480	1.08	30	-28.92



## OUTPUT POWER





## **7.1.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

### **TEST PROCEDURE**

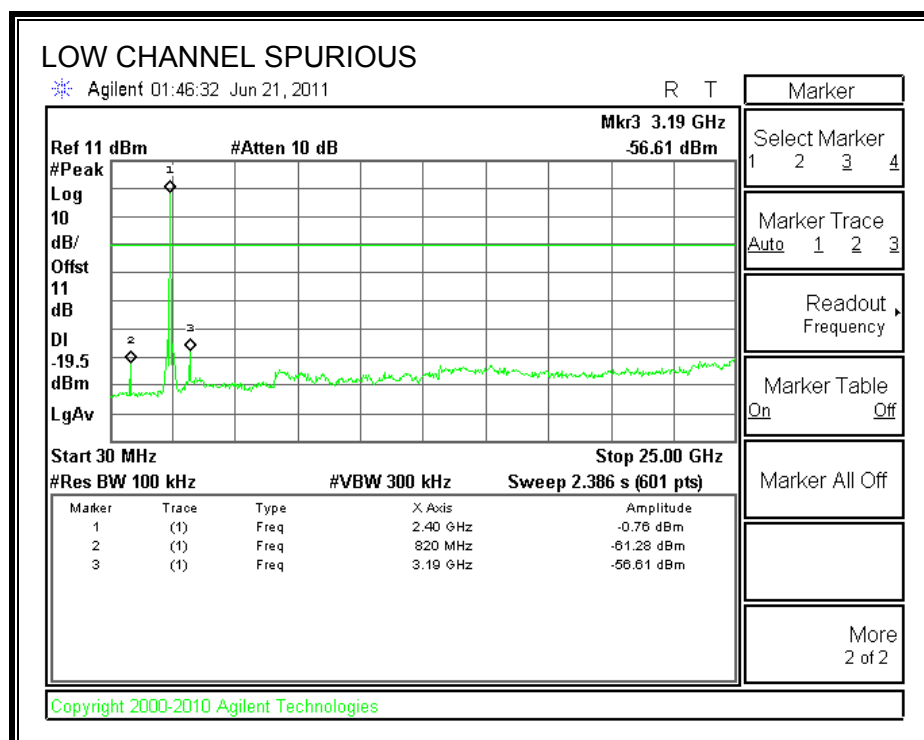
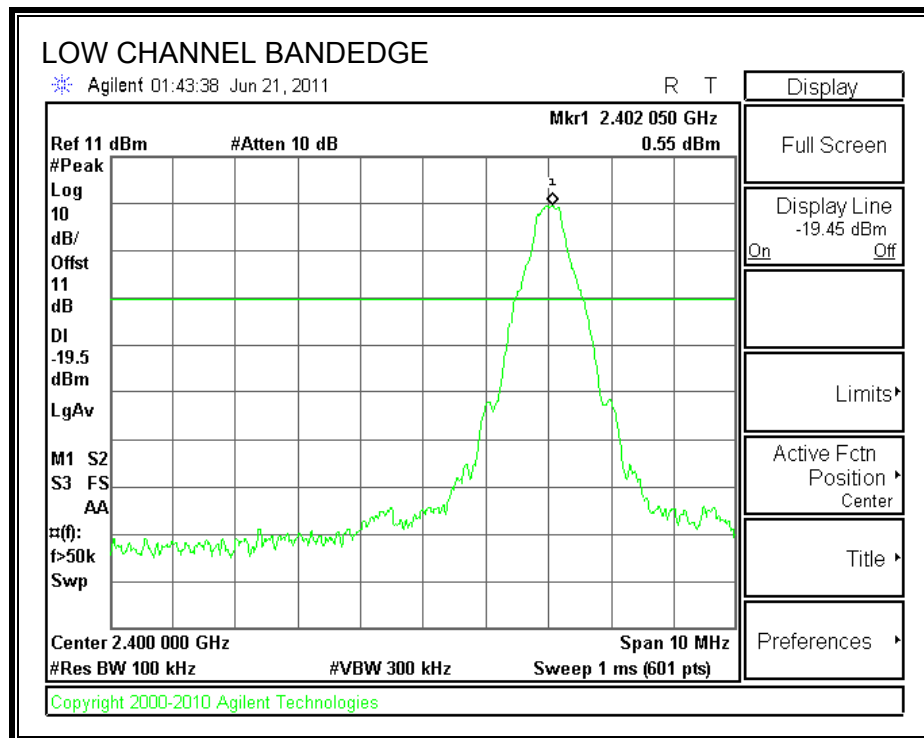
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

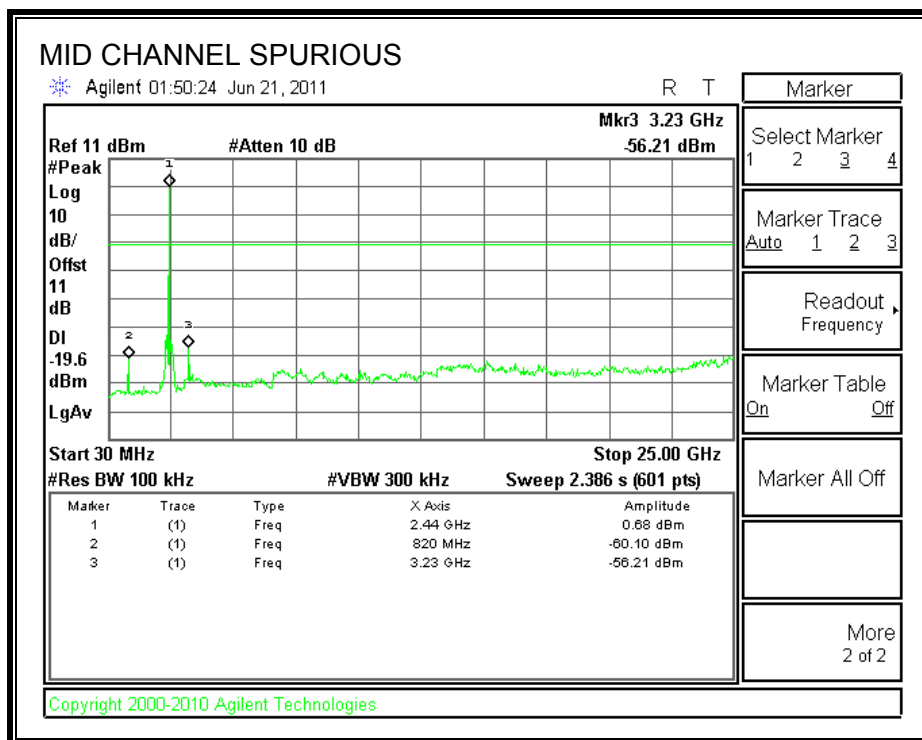
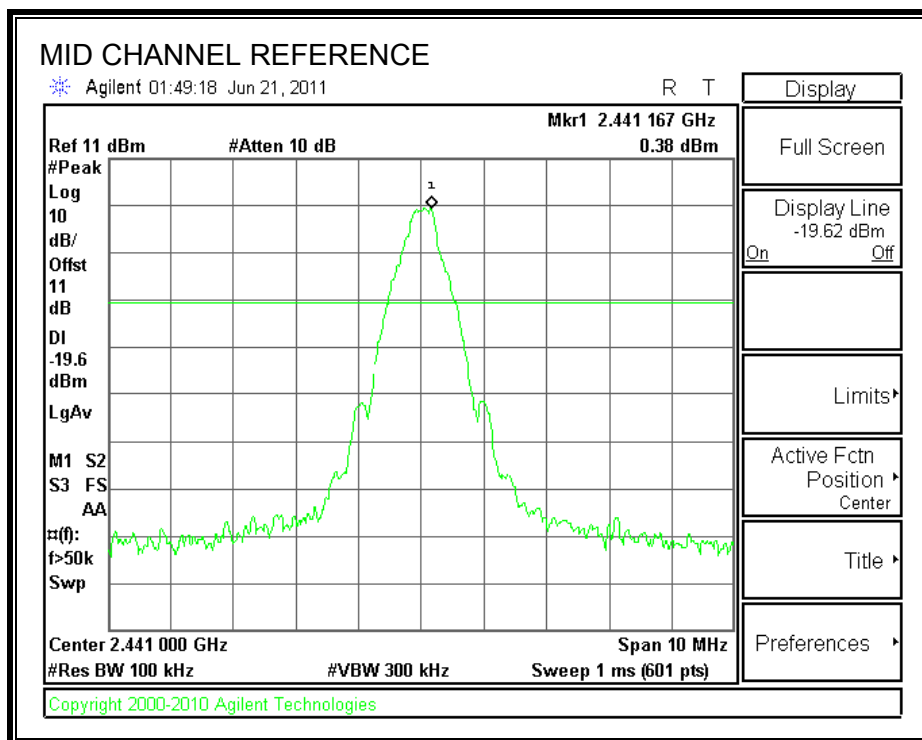
The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

### **RESULTS**

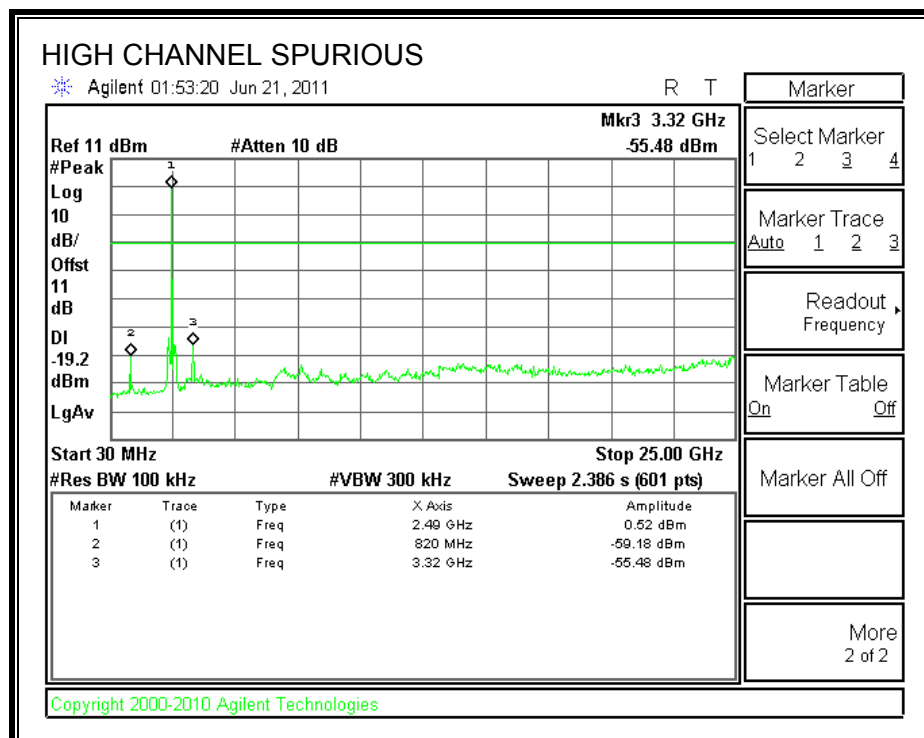
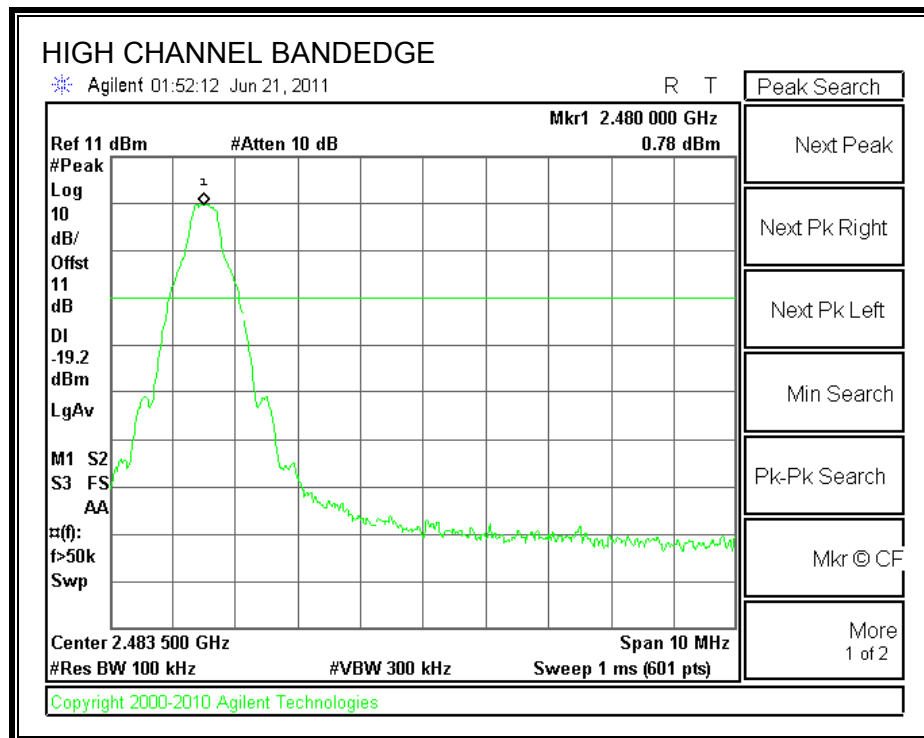
# **SPURIOUS EMISSIONS, LOW CHANNEL**



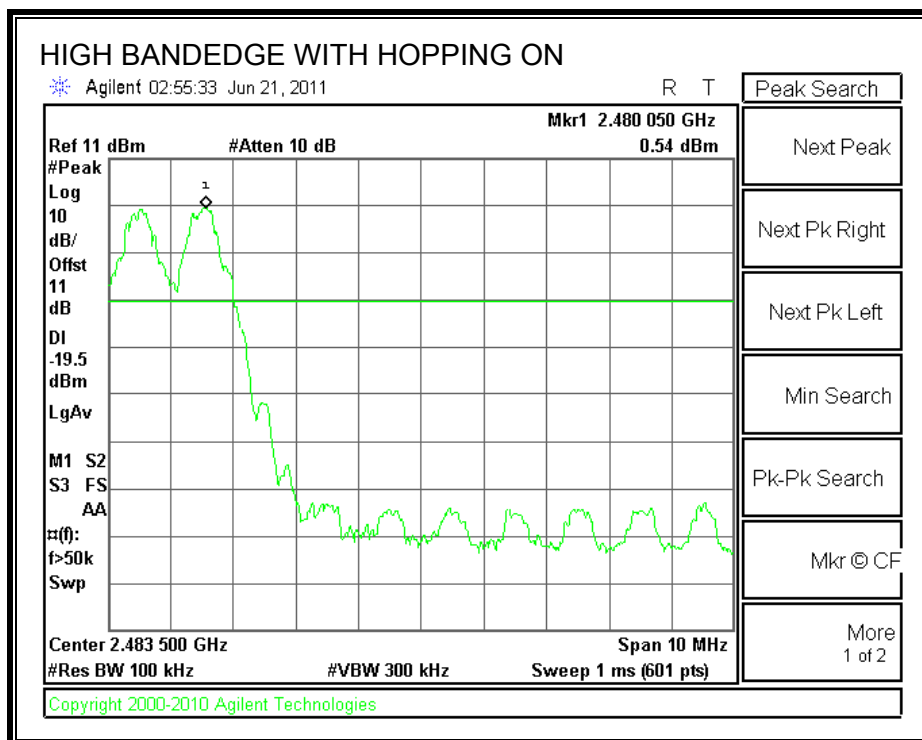
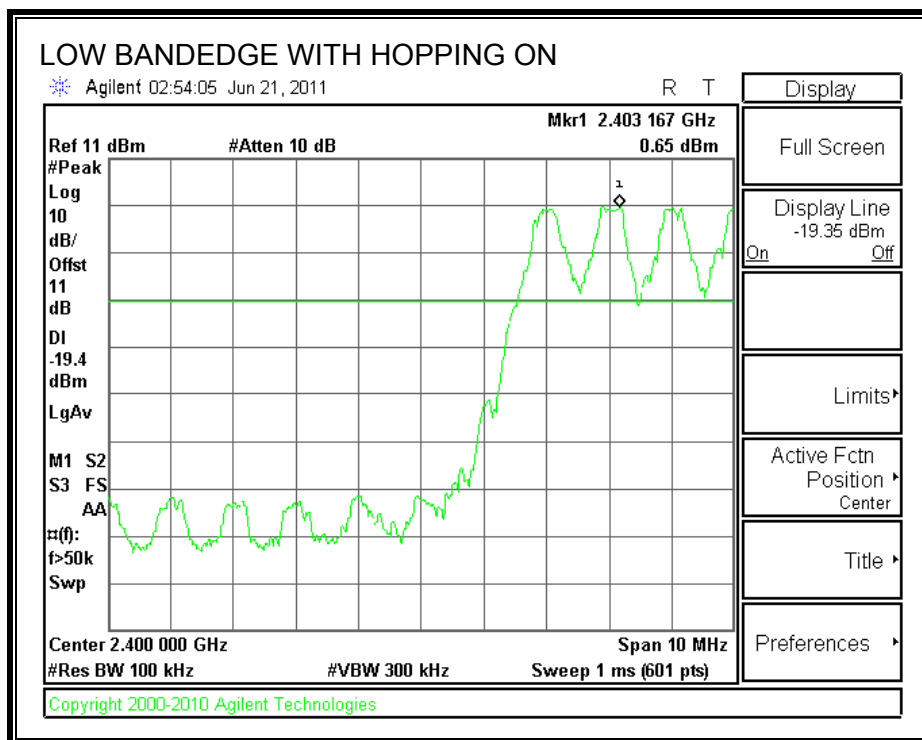
# **SPURIOUS EMISSIONS, MID CHANNEL**



# **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

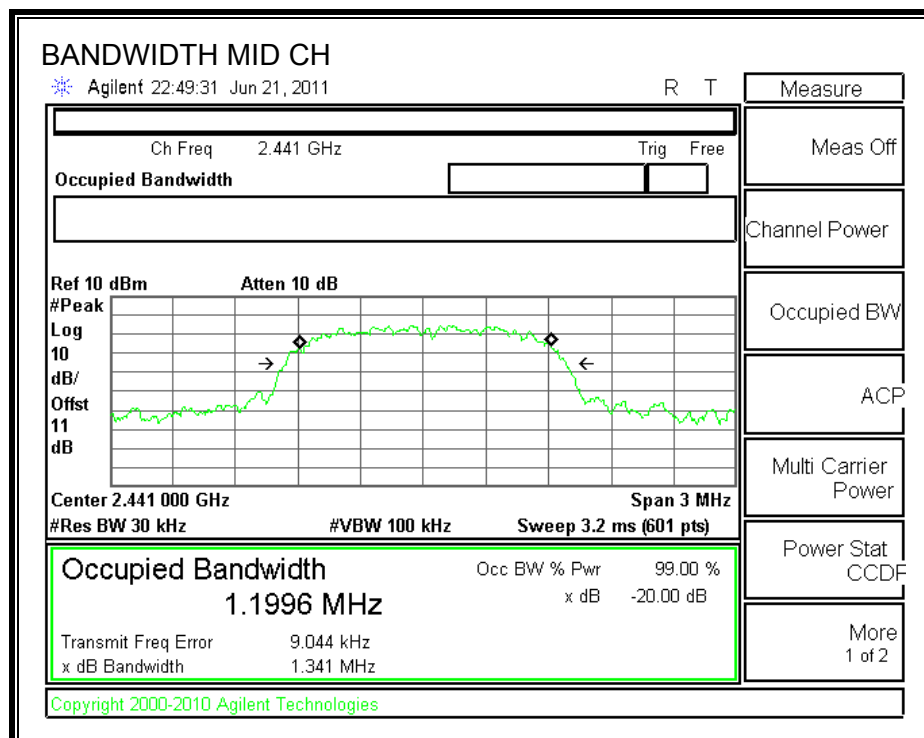
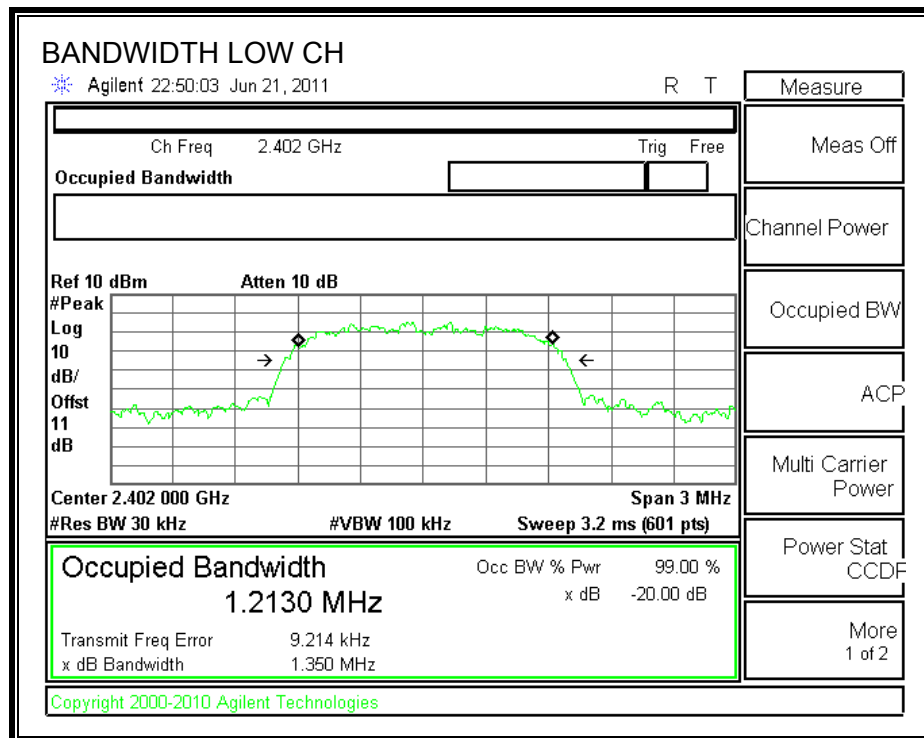
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

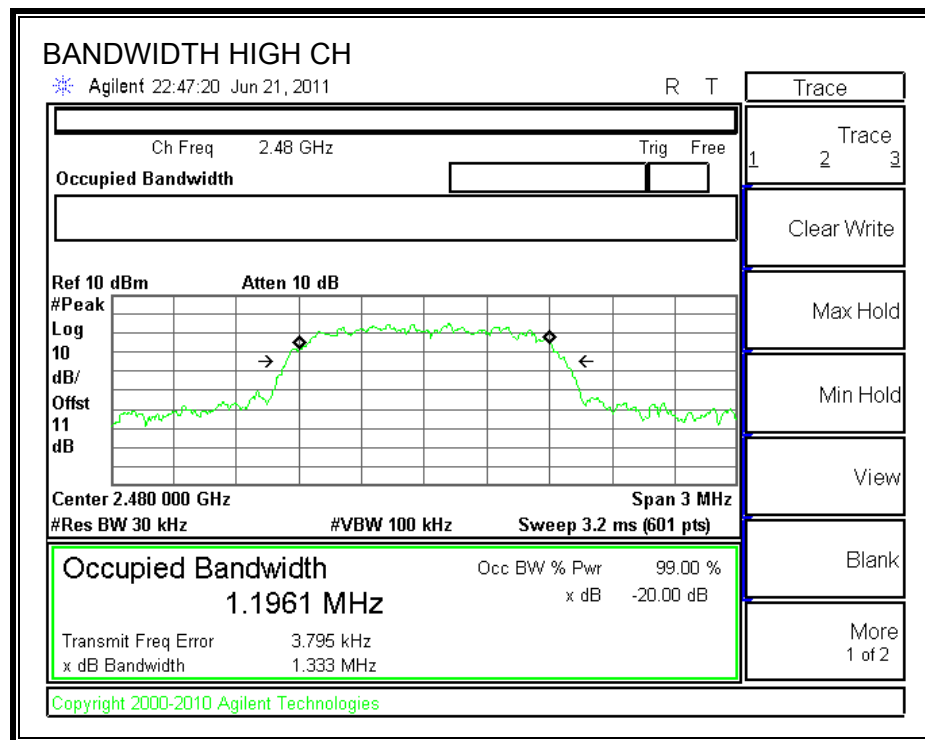
#### RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1350	1175.6
Middle	2441	1341	1176.2
High	2480	1333	1178

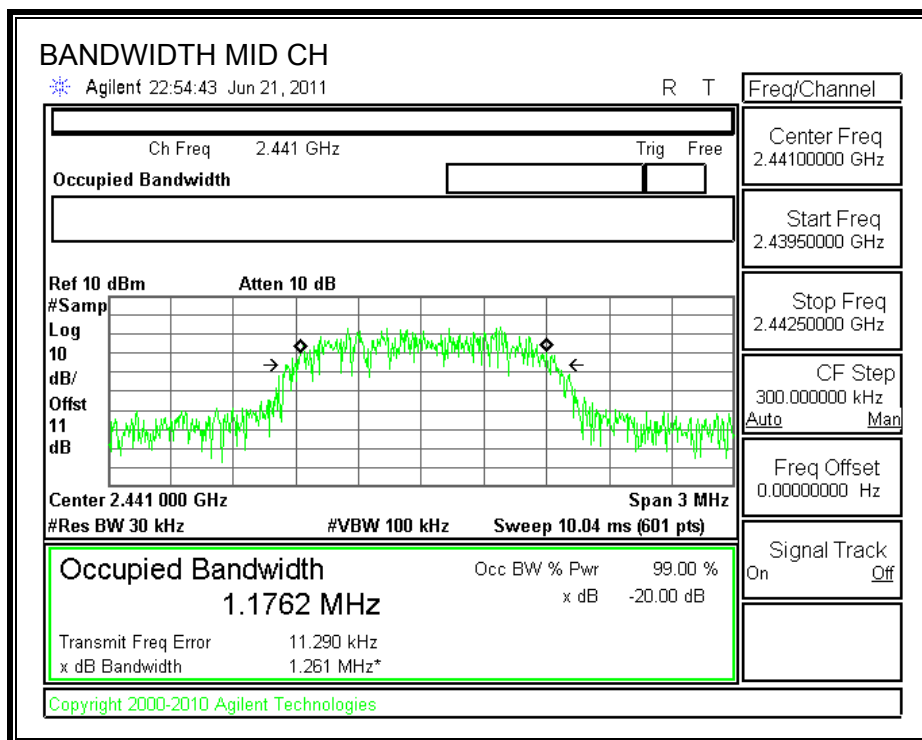
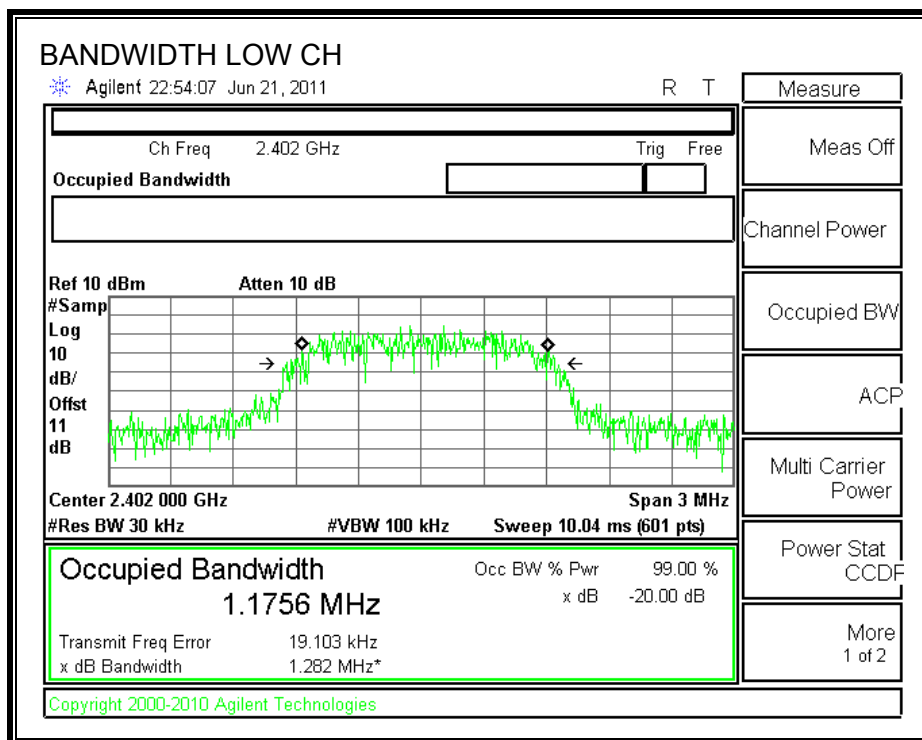


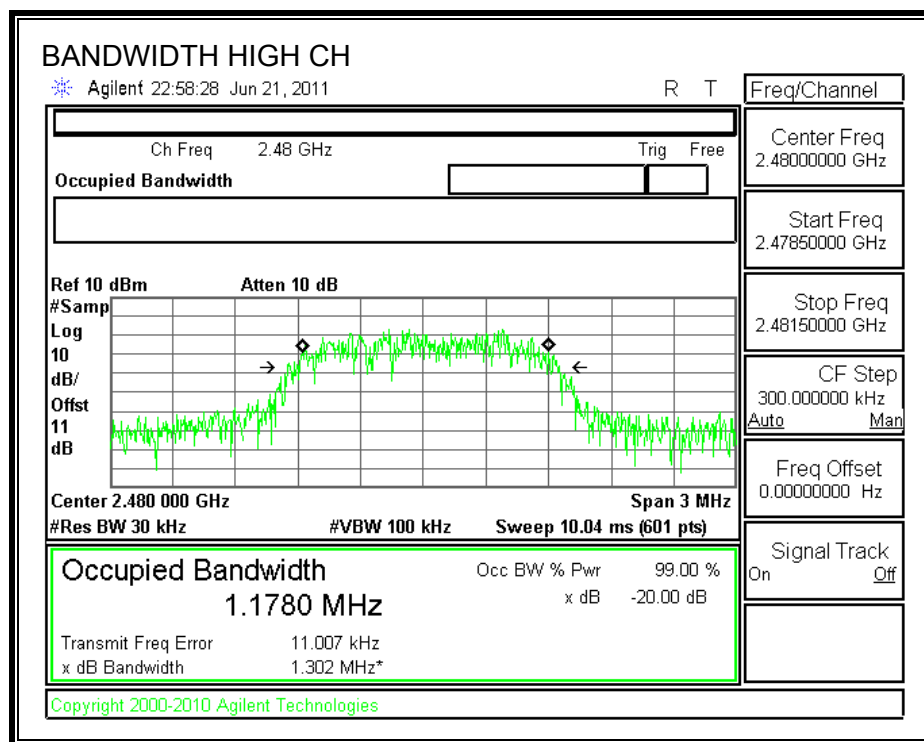
## 20 dB BANDWIDTH





# **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.

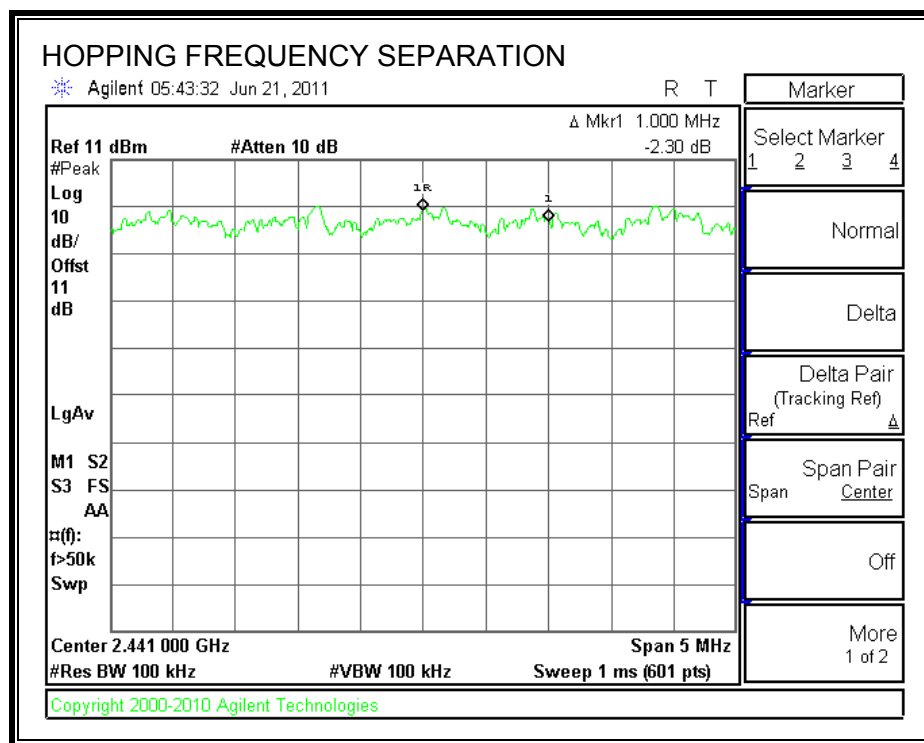
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

### TEST PROCEDURE

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

### RESULTS

#### HOPPING FREQUENCY SEPARATION



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

#### **LIMIT**

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

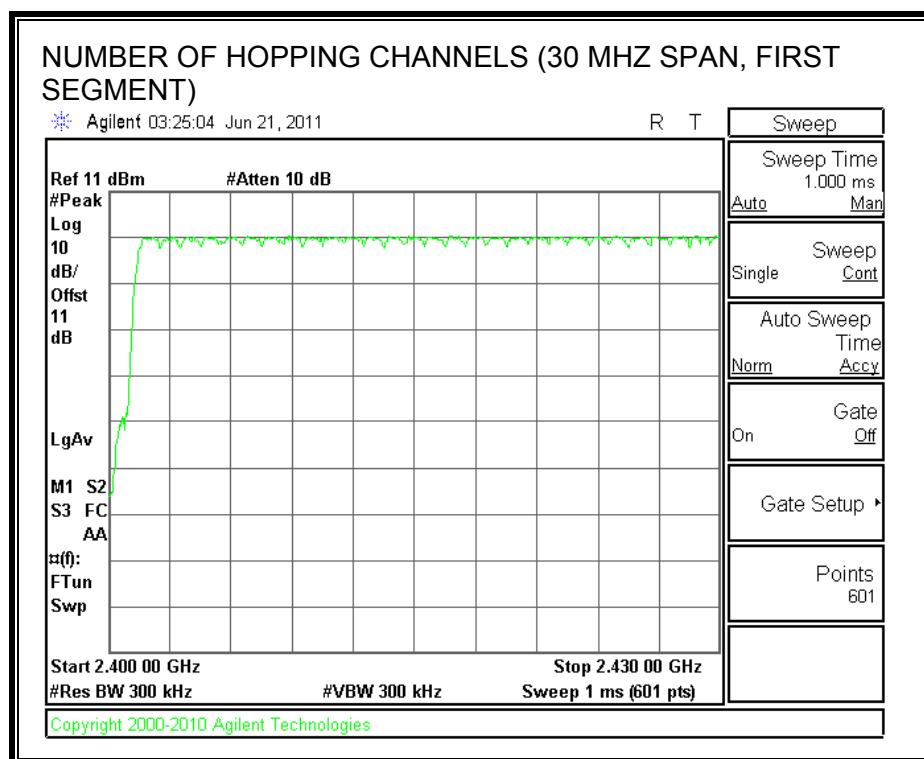
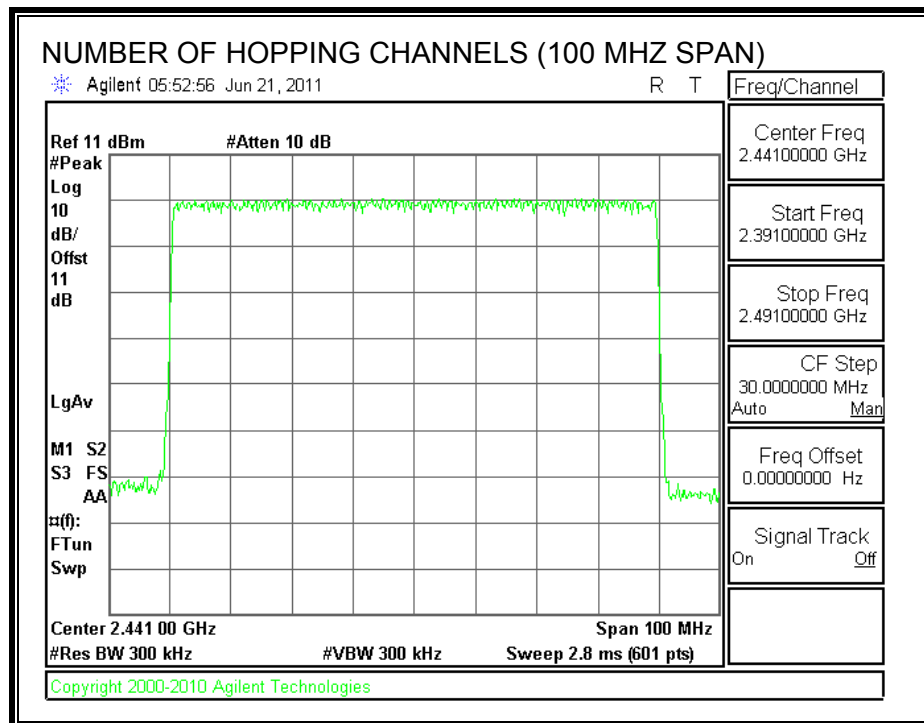
#### **TEST PROCEDURE**

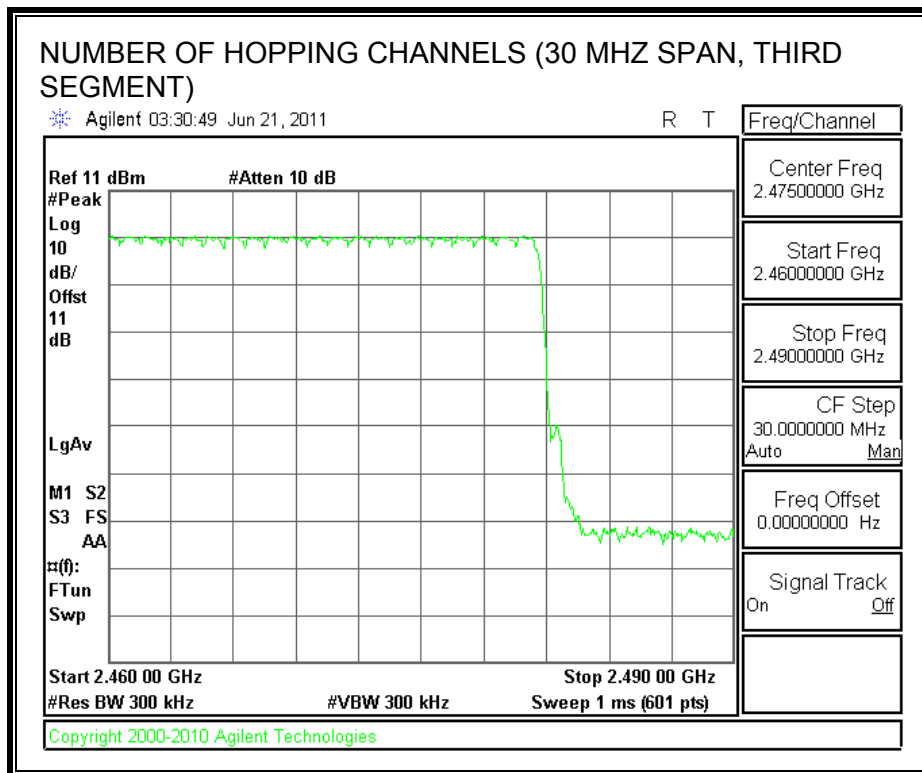
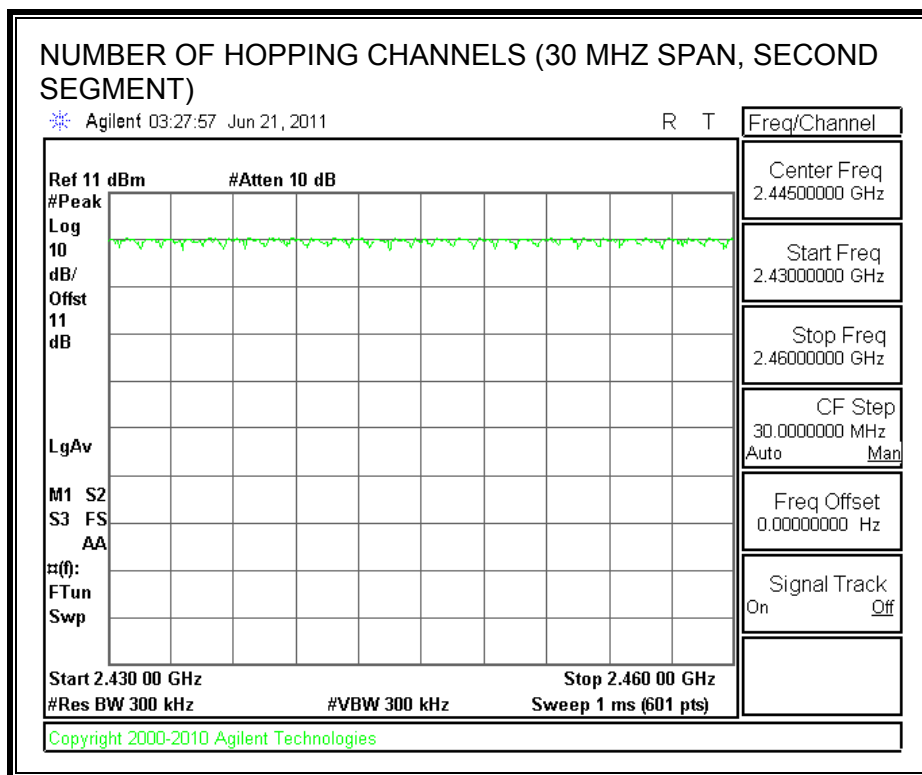
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

#### **RESULTS**

79 Channels observed.

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

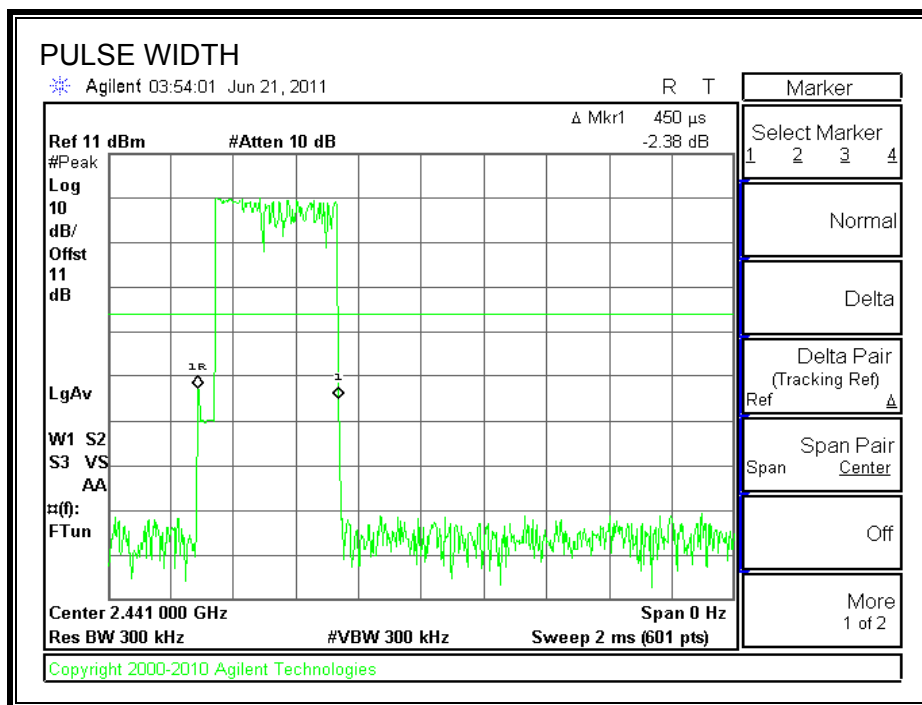
### RESULTS

#### 8PSK Mode

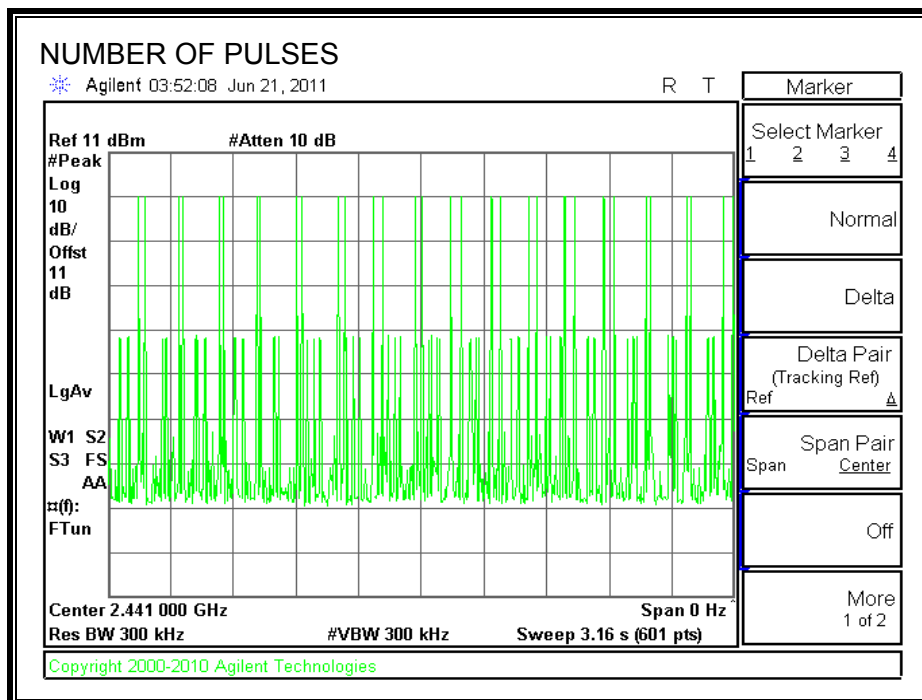
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)
DH1	0.45	32	0.144	0.4
DH3	1.707	14	0.239	0.4
DH5	2.96	11	0.326	0.4

## DH1

### PULSE WIDTH

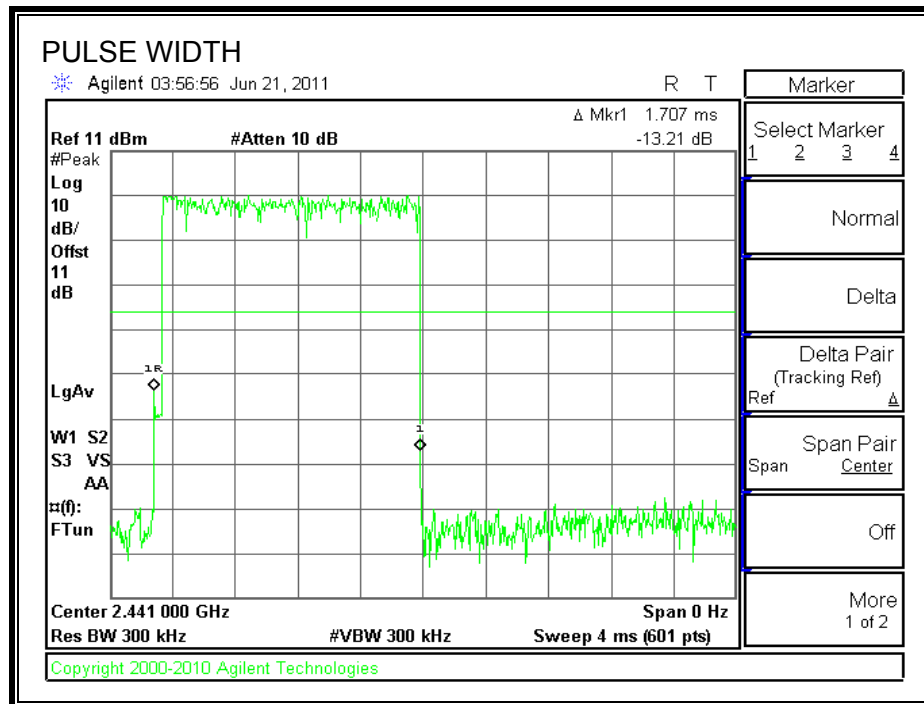


### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

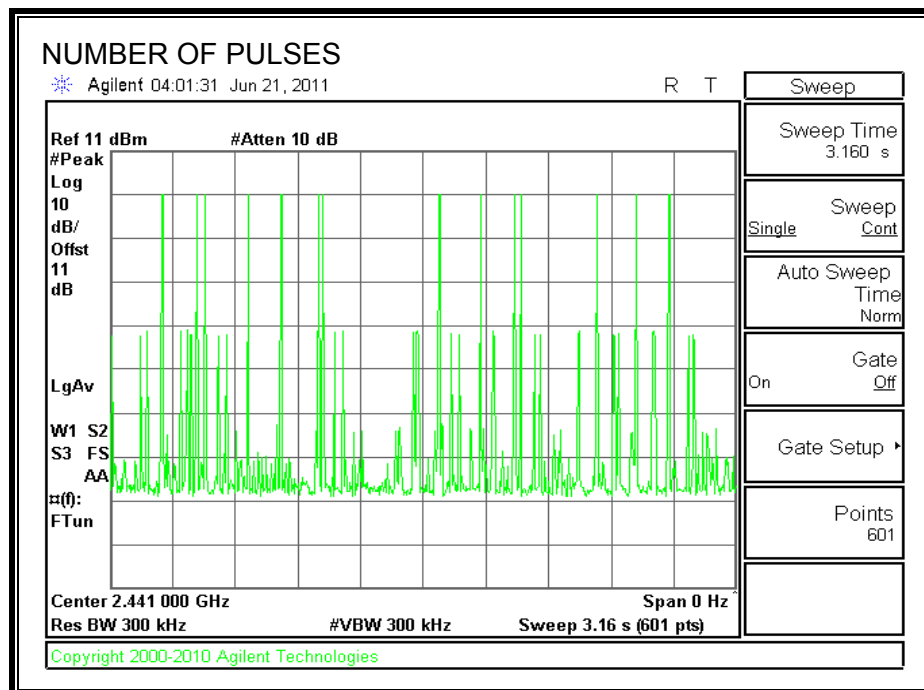


### DH3

### PULSE WIDTH

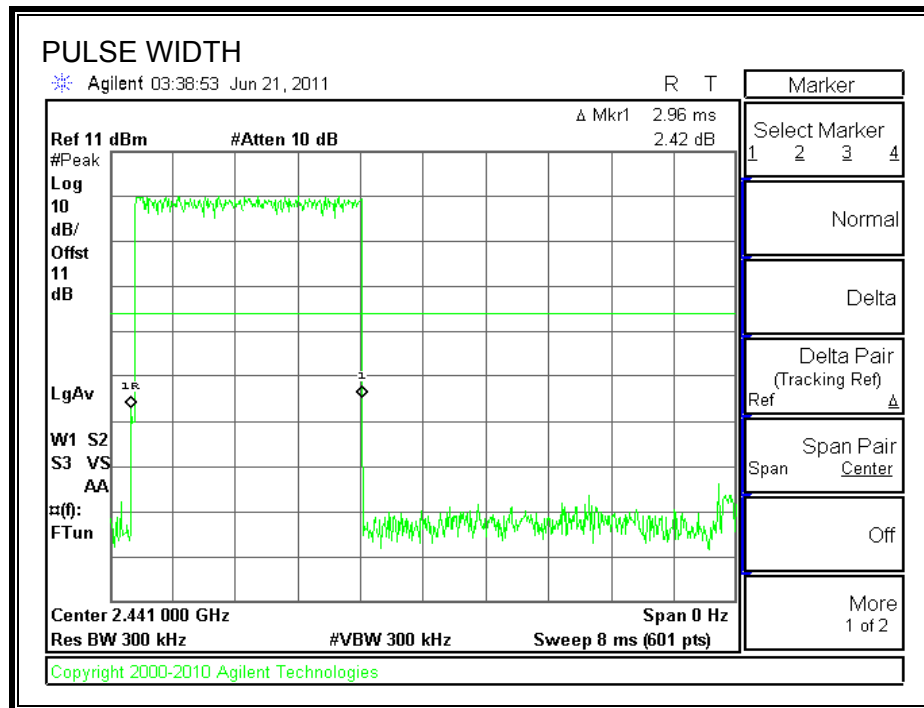


### NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

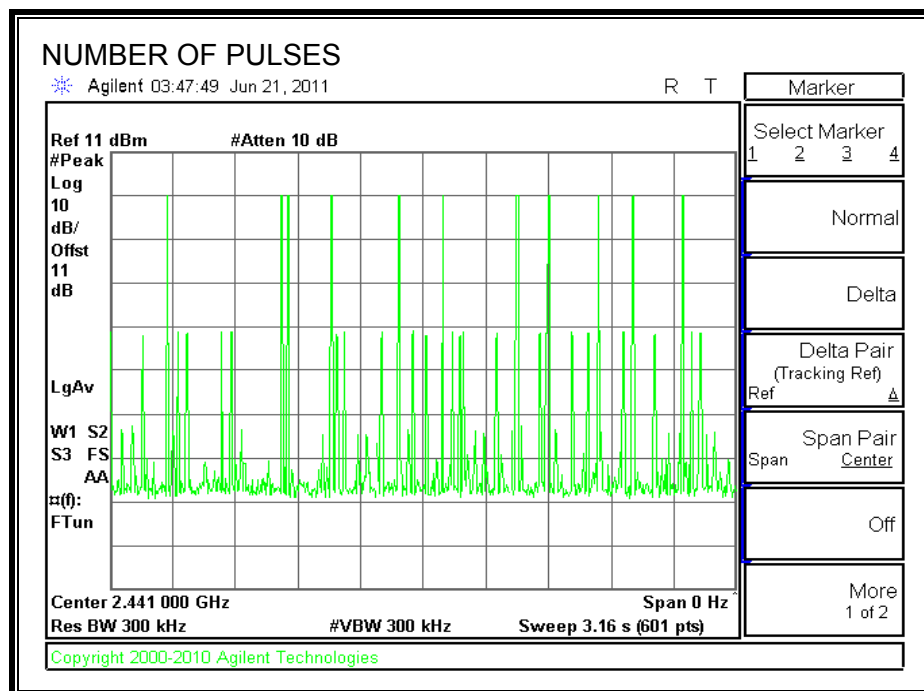


**DH5**

**PULSE WIDTH**



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





## 7.2.5. OUTPUT POWER

### LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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.

The maximum antenna gain is less than 6 dBi and the channel separation is greater than two-thirds of the 20 dB bandwidth, therefore the limit is 21 dBm.

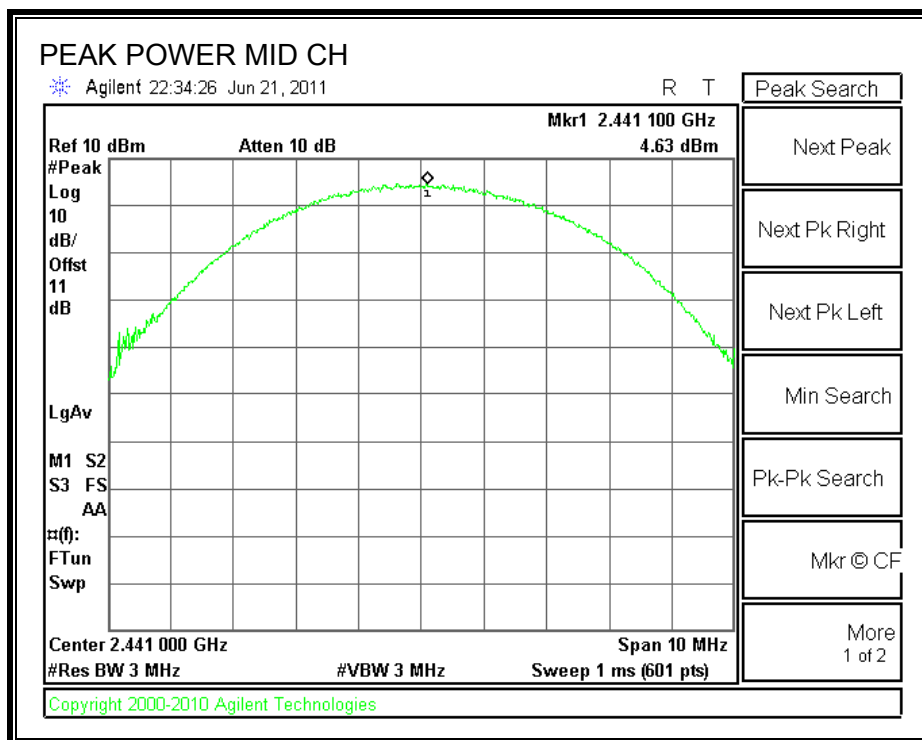
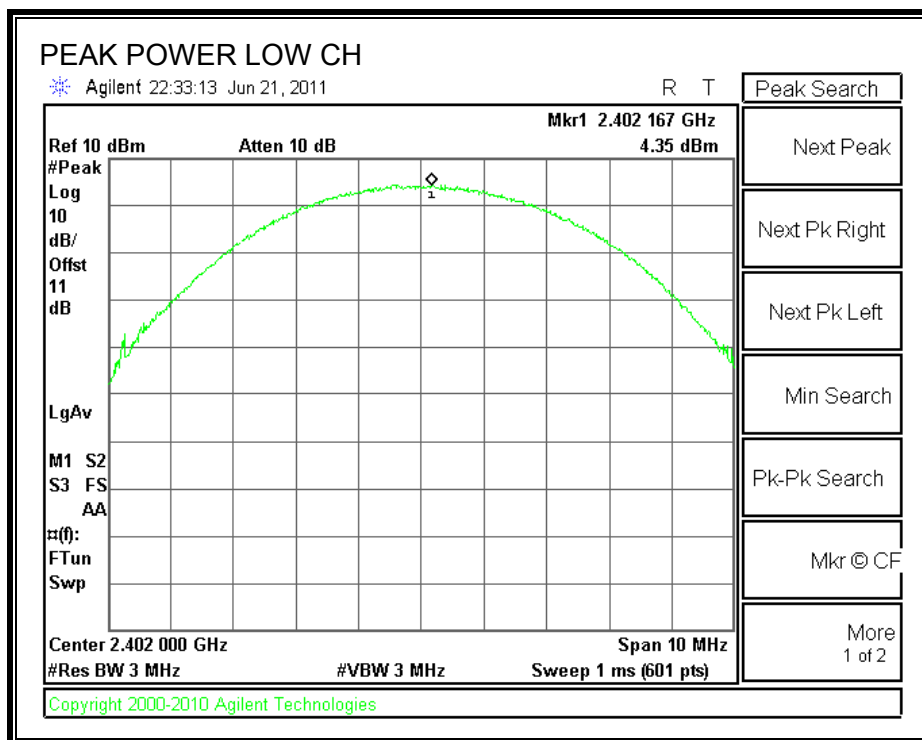
### TEST PROCEDURE

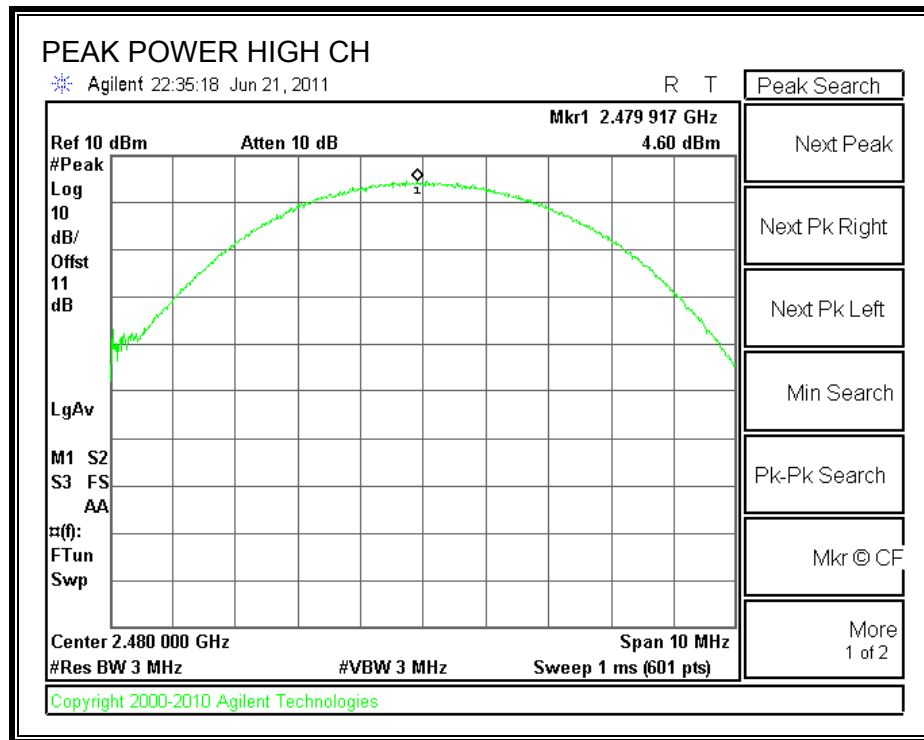
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.35	21	-16.65
Middle	2441	4.63	21	-16.37
High	2480	4.60	21	-16.40

## OUTPUT POWER







## **7.2.6. CONDUCTED SPURIOUS EMISSIONS**

### **LIMITS**

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

### **TEST PROCEDURE**

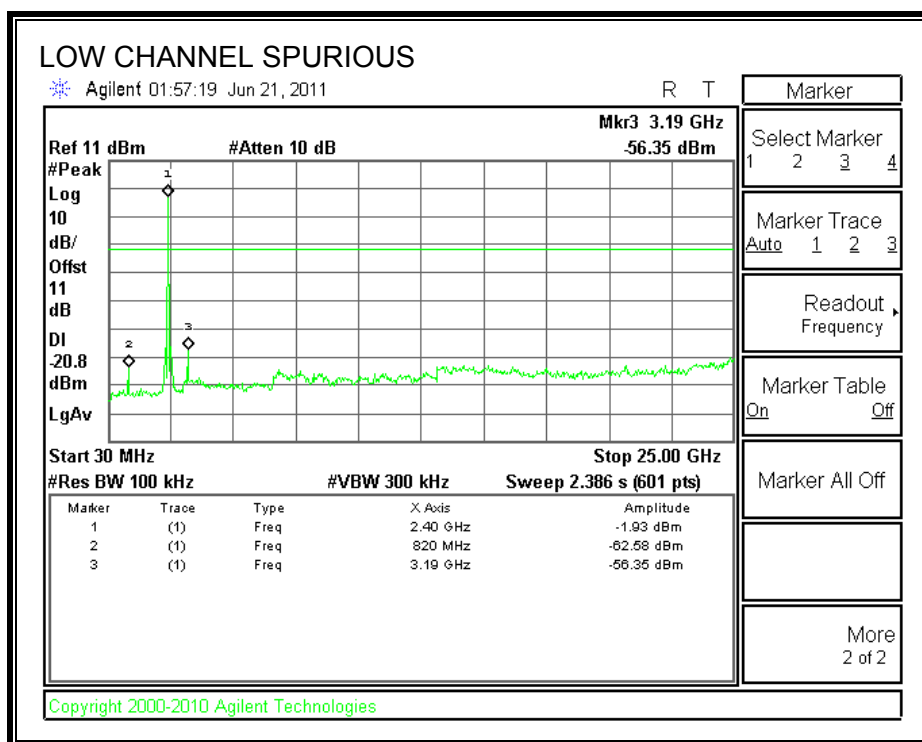
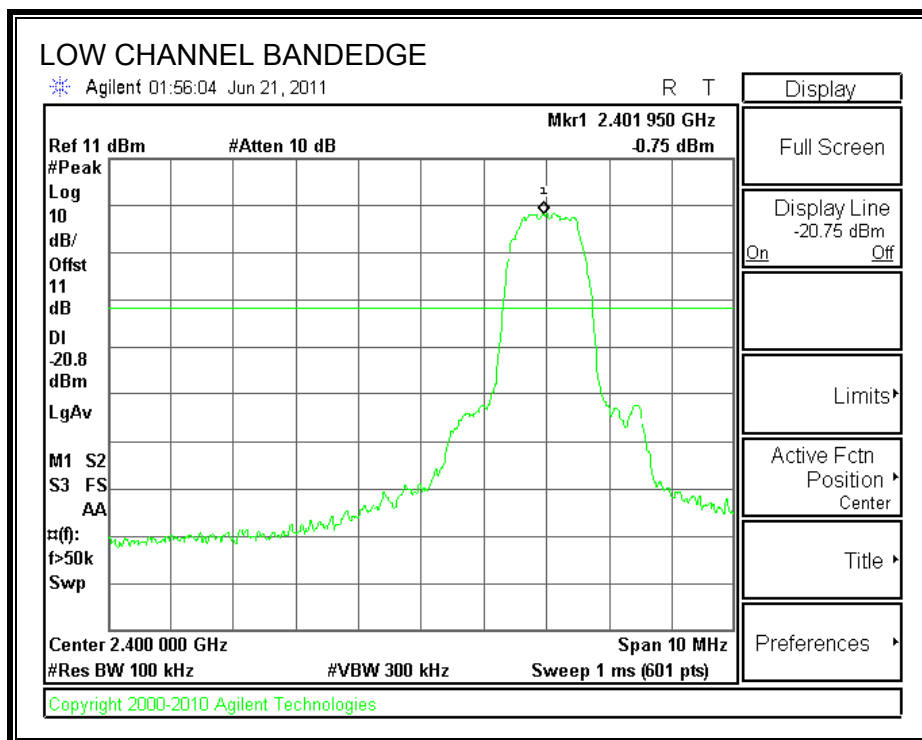
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

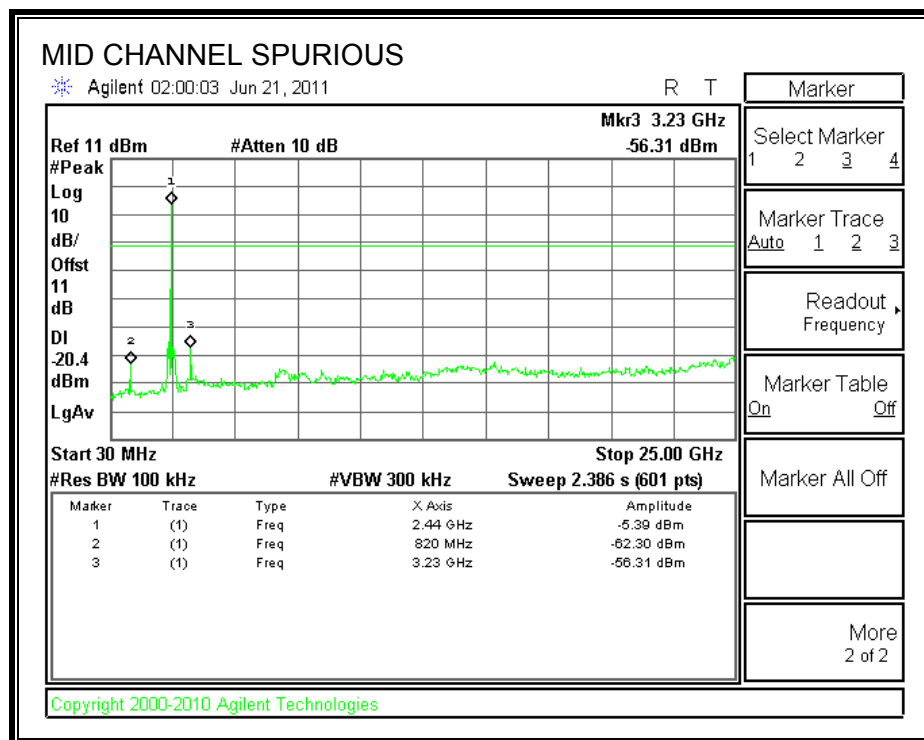
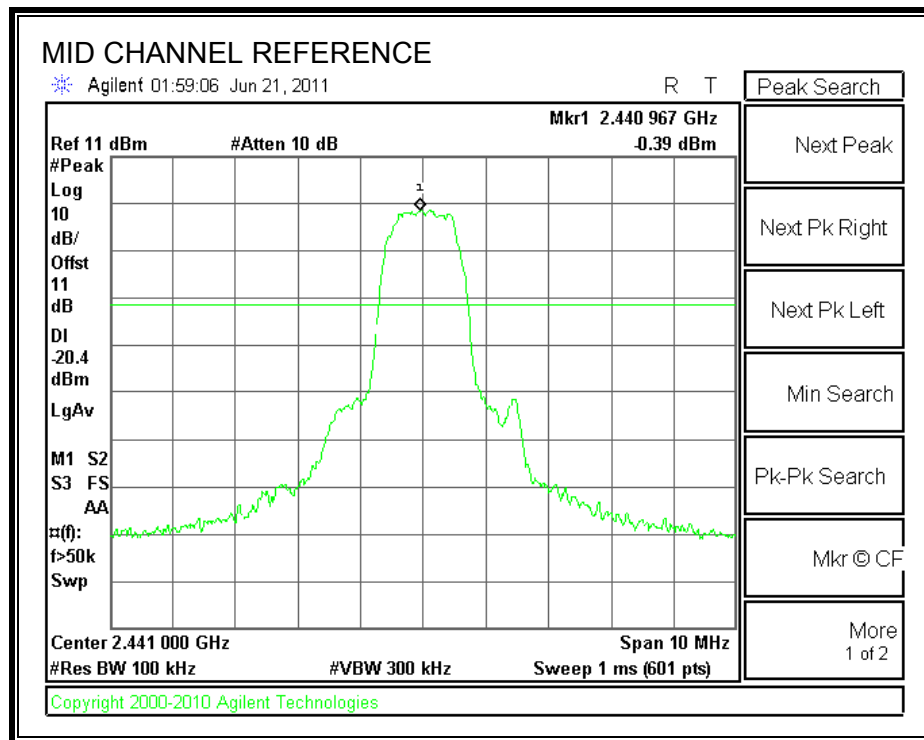
The band edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

### **RESULTS**

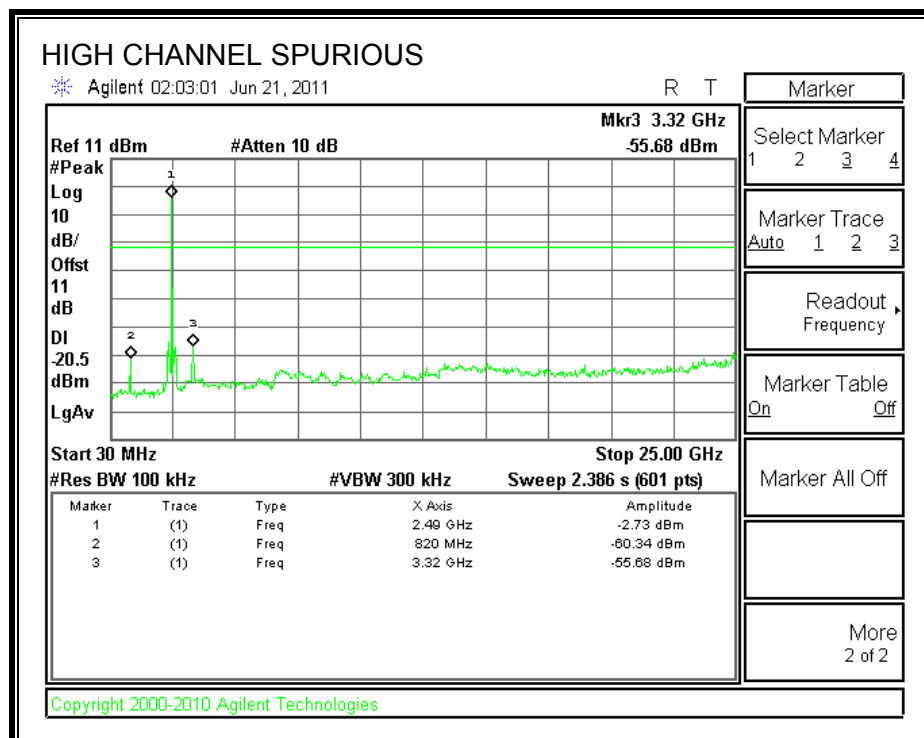
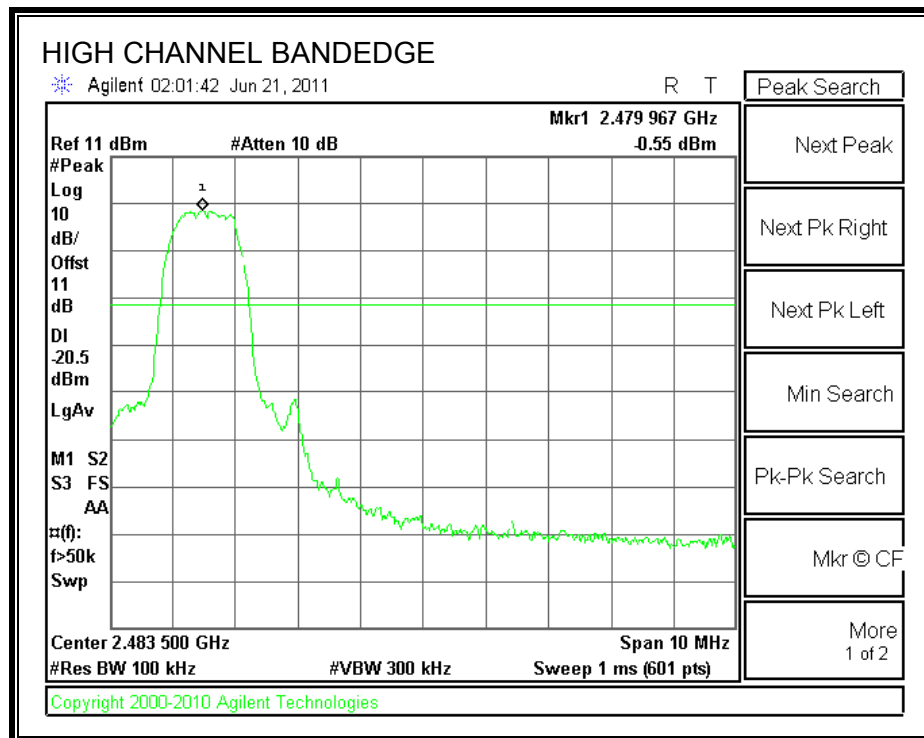
## SPURIOUS EMISSIONS, LOW CHANNEL



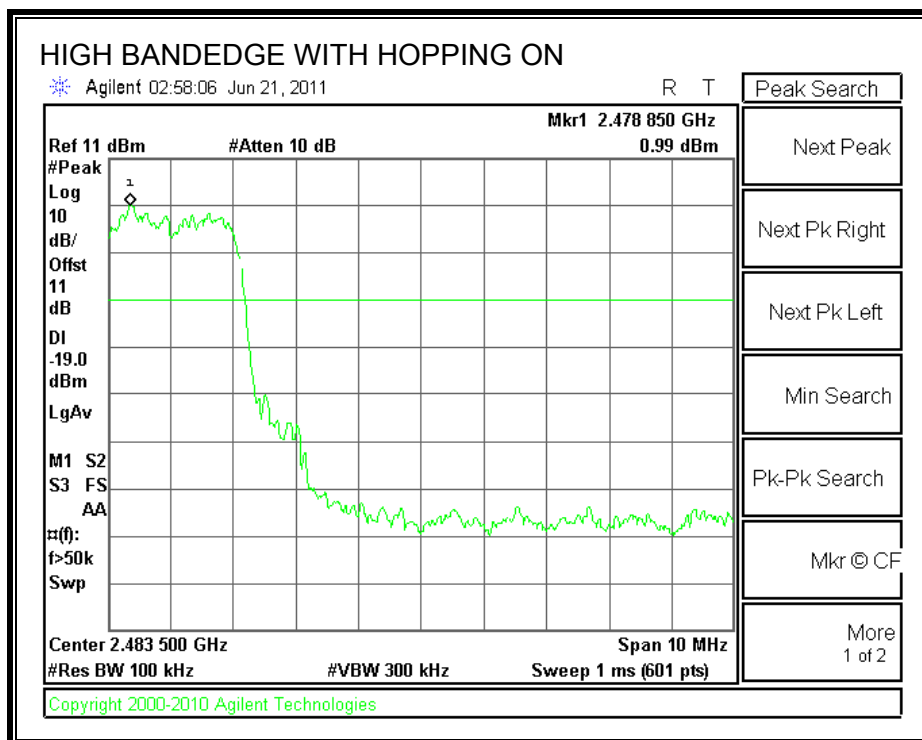
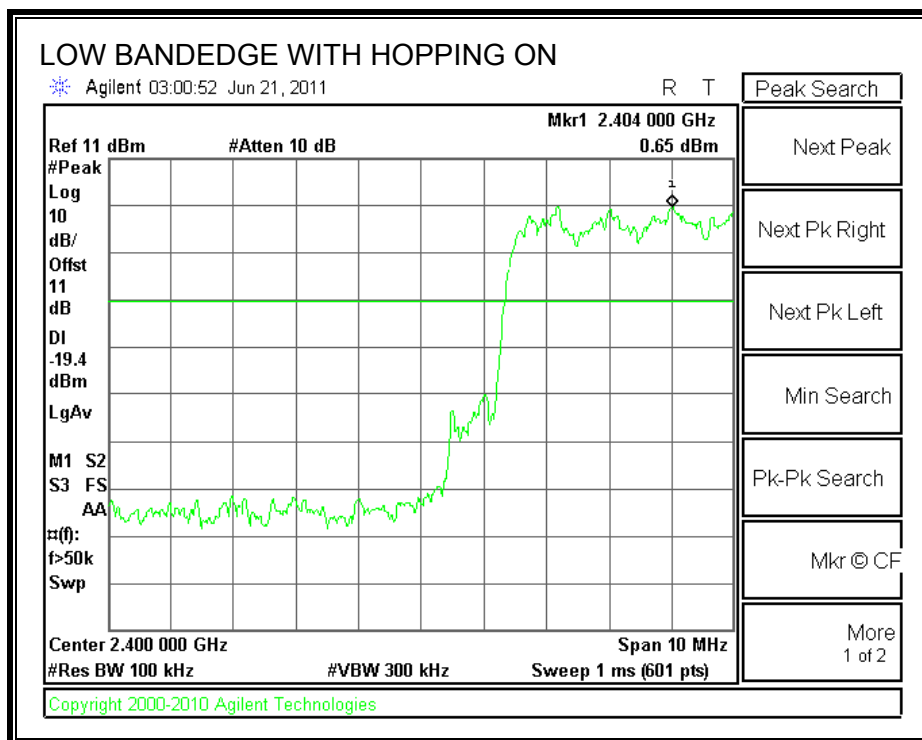
# **SPURIOUS EMISSIONS, MID CHANNEL**



# 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.

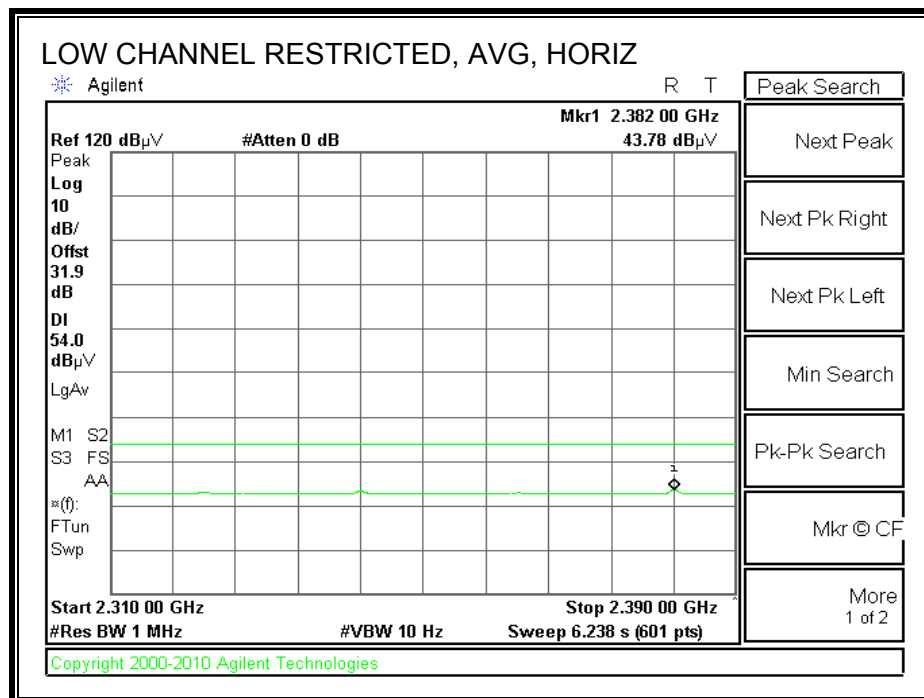
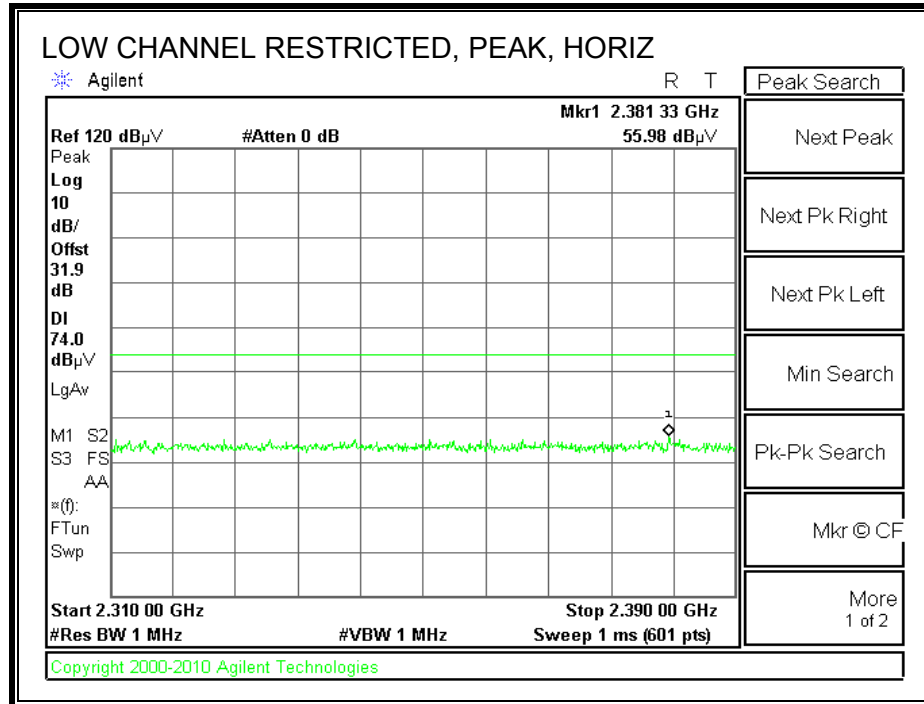
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

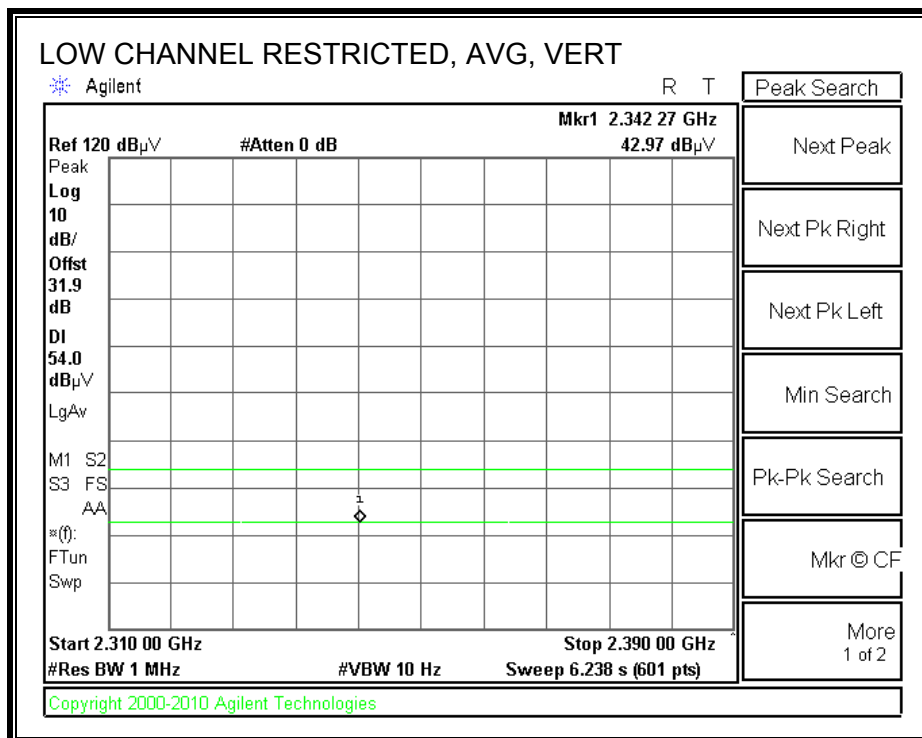
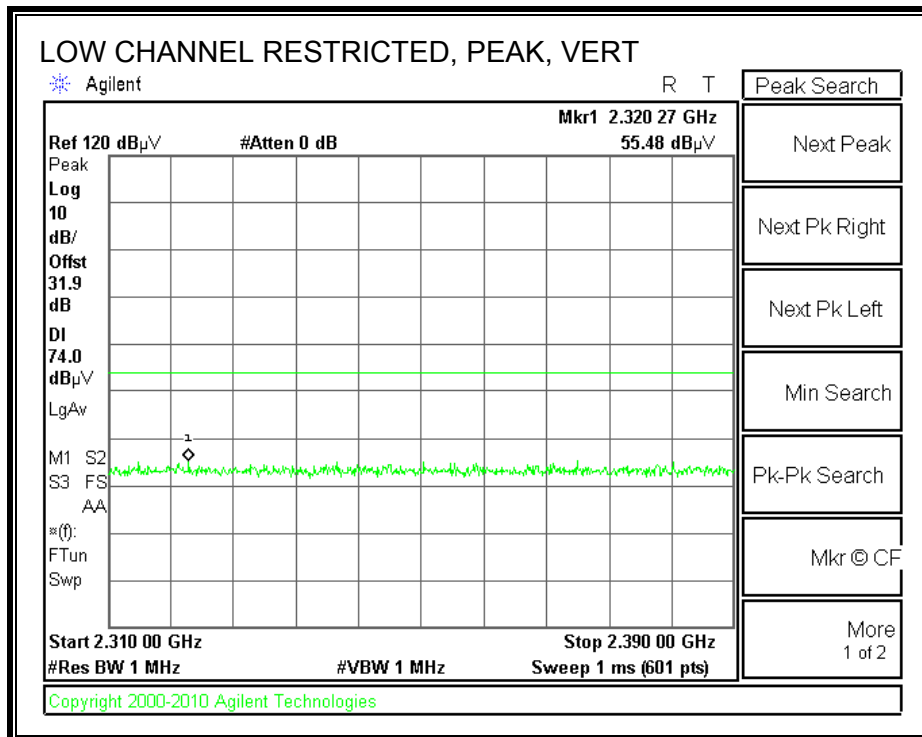
## 8.2. TRANSMITTER ABOVE 1 GHz

### 8.2.1. BASIC DATA RATE GFSK MODULATION

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

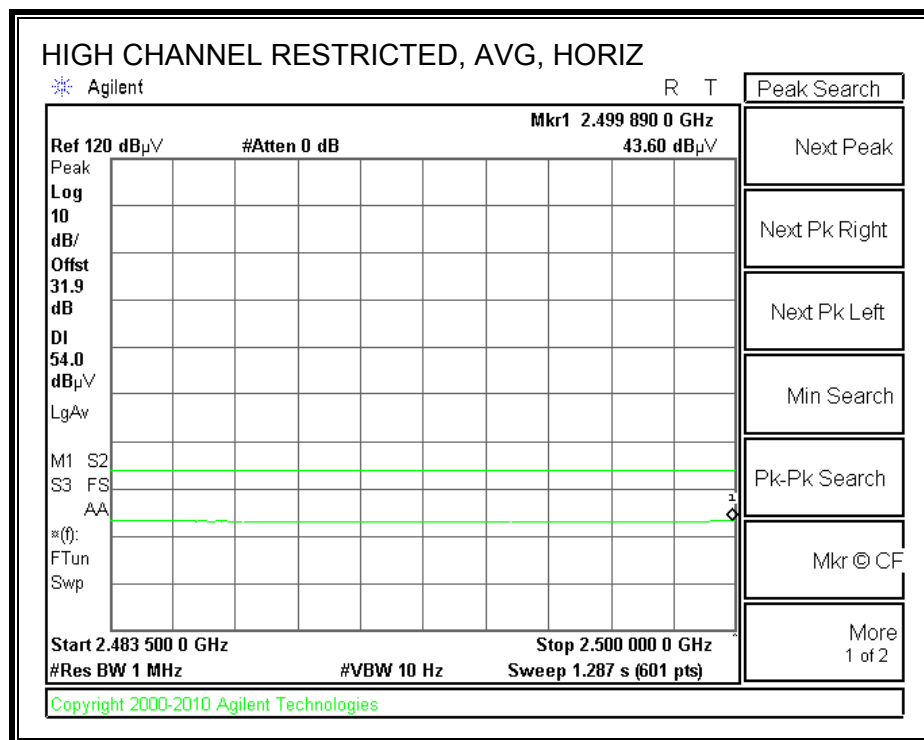
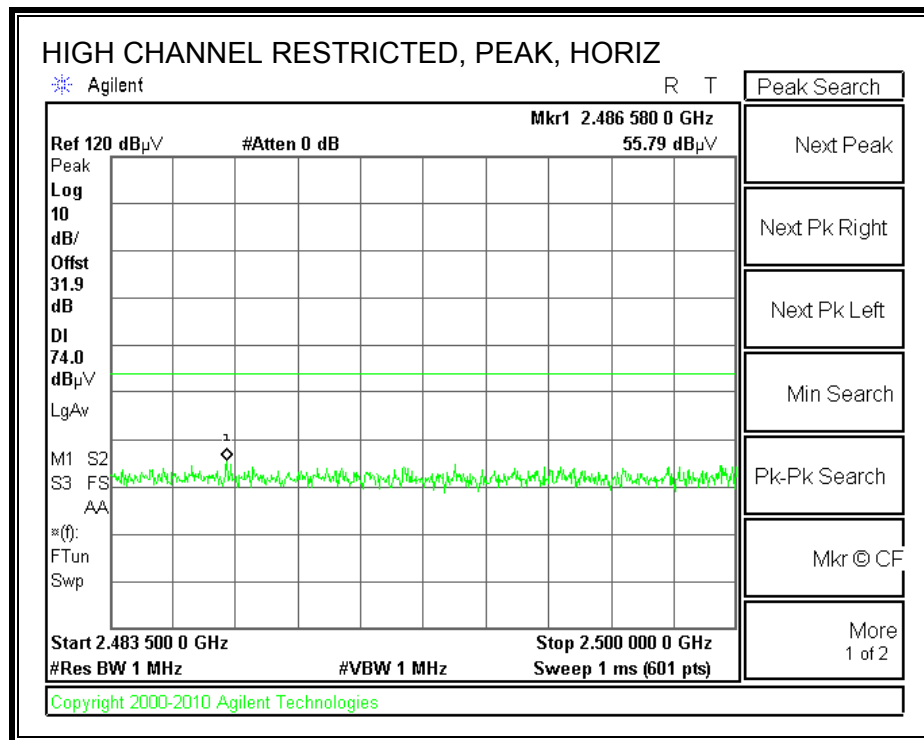


**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**

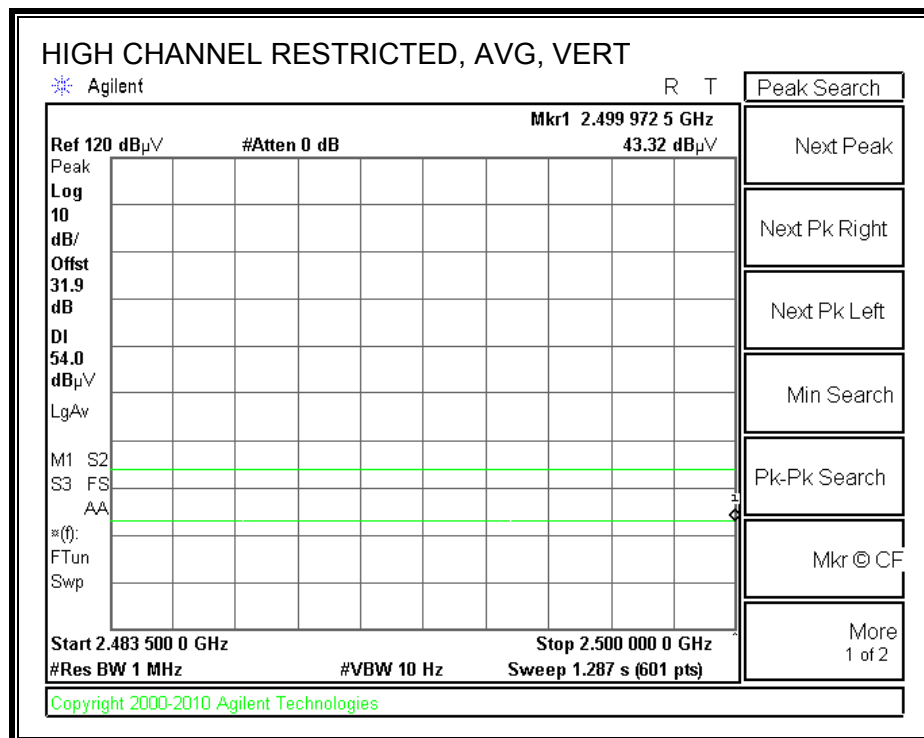
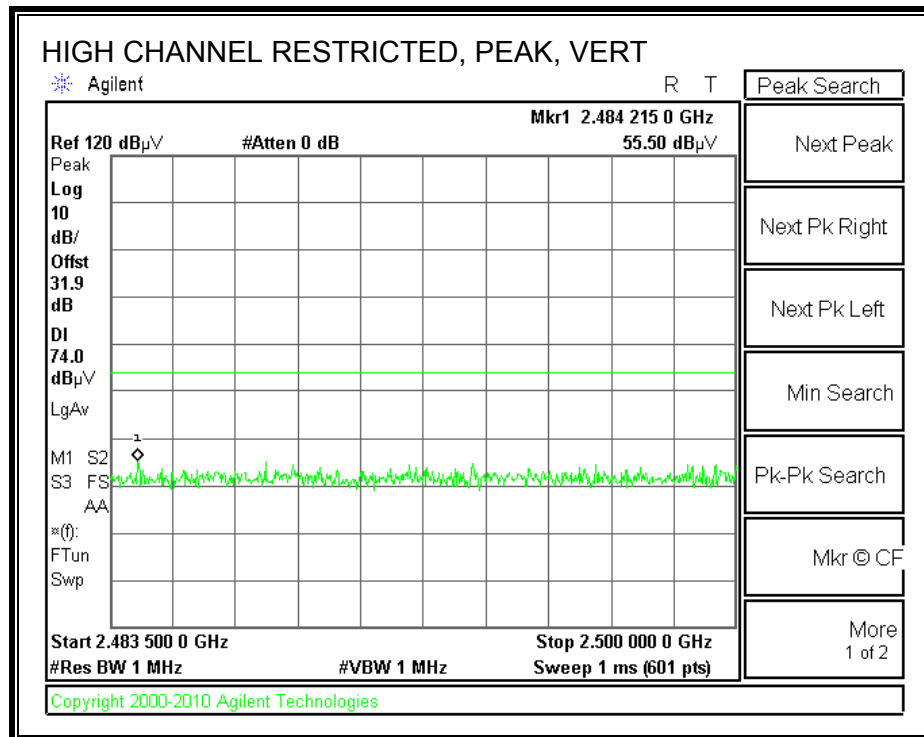




**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**



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

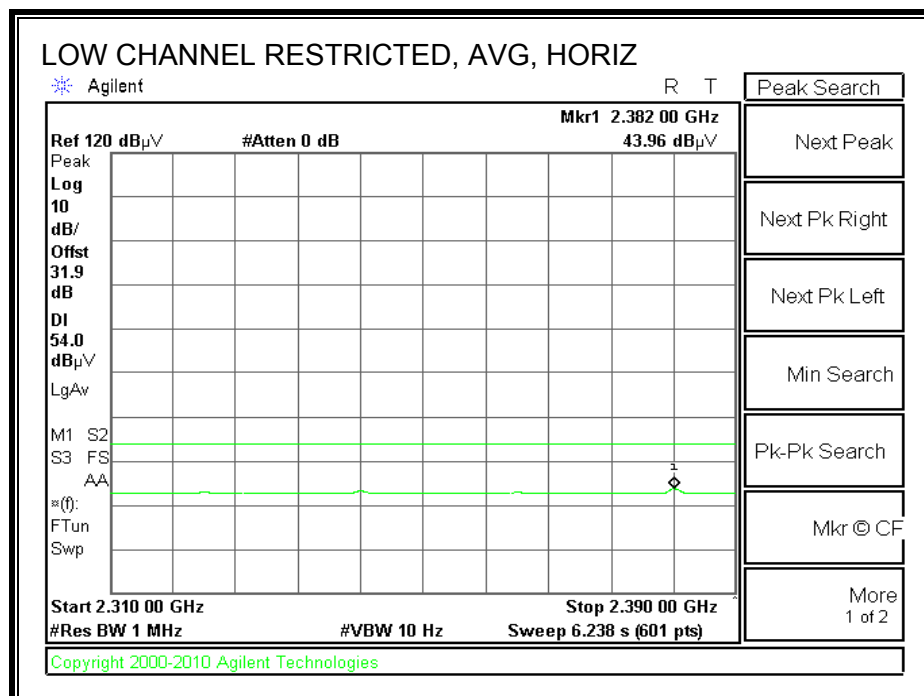
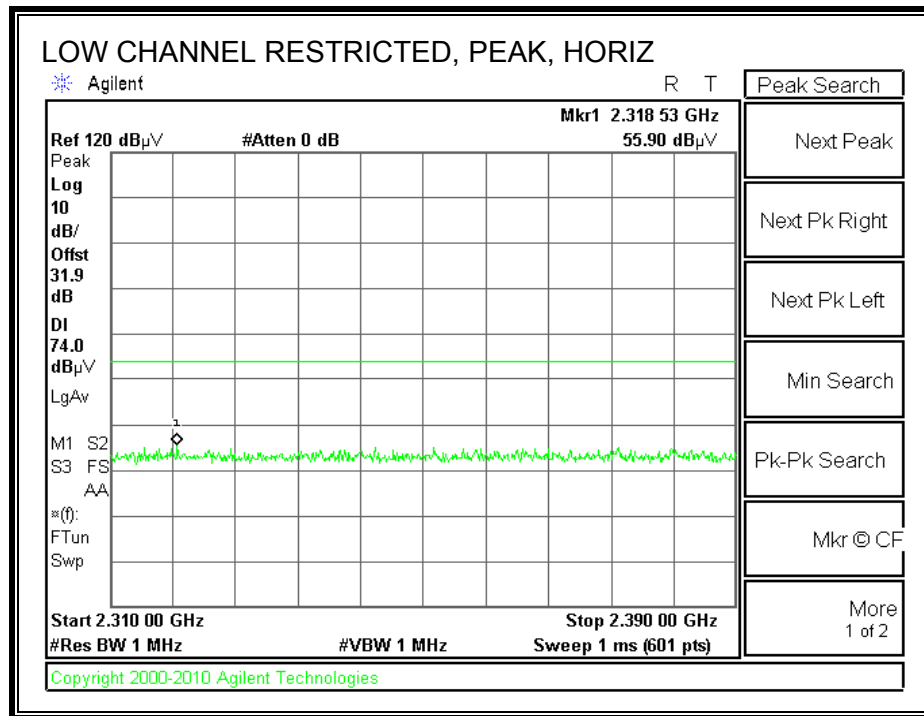


## HARMONICS AND SPURIOUS EMISSIONS

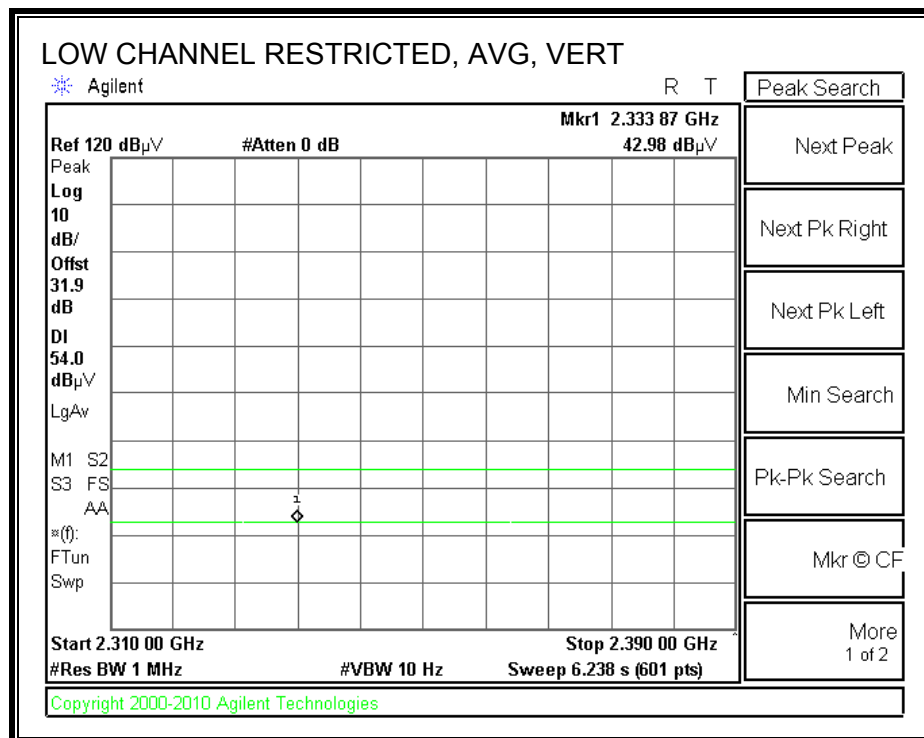
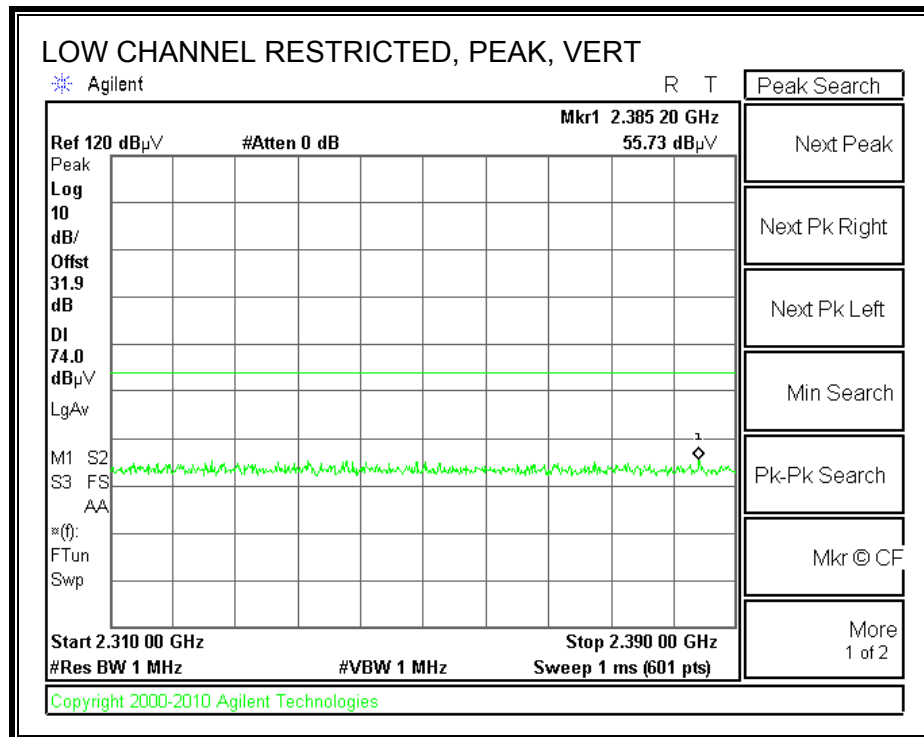
High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company:		BroadCom Corporation														
Project #:		11U13795														
Date:		6/22/2011														
Test Engineer:		David Garcia														
Configuration:		EUT, Antenna, support Laptop														
Mode:		Tx, GFSK Mode														
Test Equipment:																
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit				
T60; S/N: 2238 @3m			T34 HP 8449B						T125; ARA 18-26GHz; S/N:1007			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	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)	
<b>Harmonics Spurious</b>																
<b>Low Ch 2402MHz</b>																
4.804	3.0	35.4	24.1	32.7	5.8	-34.8	0.0	0.0	39.0	27.7	74	54	-35.0	-26.3	H	
4.804	3.0	36.4	27.2	32.7	5.8	-34.8	0.0	0.0	40.0	30.8	74	54	-34.0	-23.2	V	
<b>Mid Ch 2441 MHz</b>																
4.882	3.0	33.1	23.0	32.7	5.8	-34.8	0.0	0.0	36.9	26.7	74	54	-37.1	-27.3	H/Noise Floor	
4.882	3.0	35.1	24.2	32.7	5.8	-34.8	0.0	0.0	38.8	27.9	74	54	-35.2	-26.1	V	
7.323	3.0	33.9	23.8	35.5	7.3	-34.1	0.0	0.0	42.5	32.4	74	54	-31.5	-21.6	V	
<b>High Ch 2480MHz</b>																
4.960	3.0	36.1	24.7	32.8	5.9	-34.8	0.0	0.0	40.0	28.5	74	54	-34.0	-25.5	H	
4.960	3.0	37.1	26.4	32.8	5.9	-34.8	0.0	0.0	40.9	30.3	74	54	-33.1	-23.7	V	
7.440	3.0	34.2	23.8	35.6	7.3	-34.1	0.0	0.0	43.1	32.7	74	54	-30.9	-21.3	V	
Rev. 07.22.09																
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

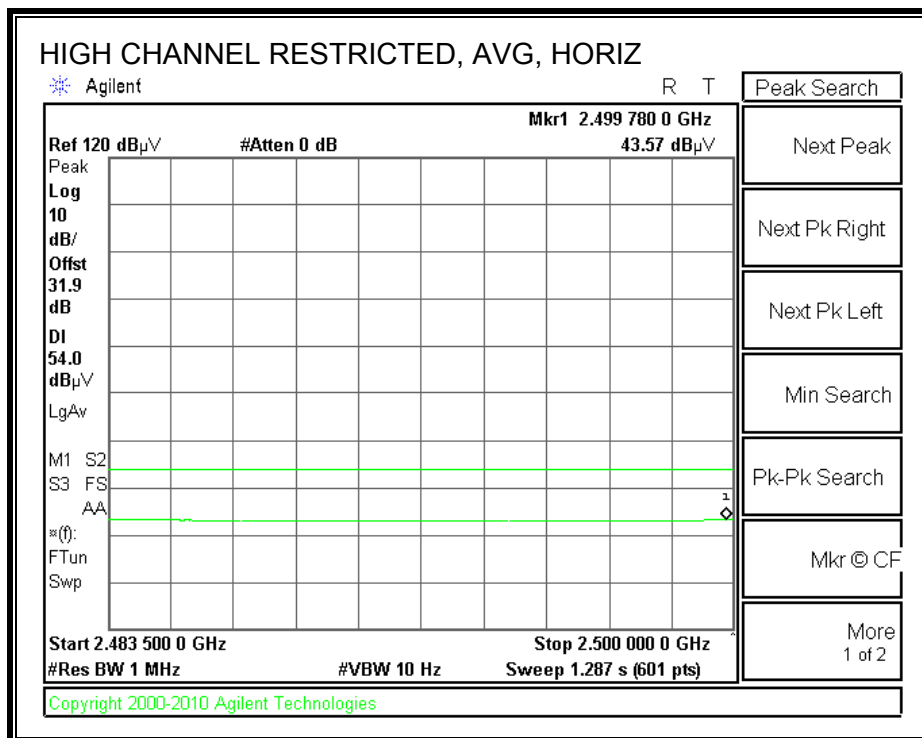
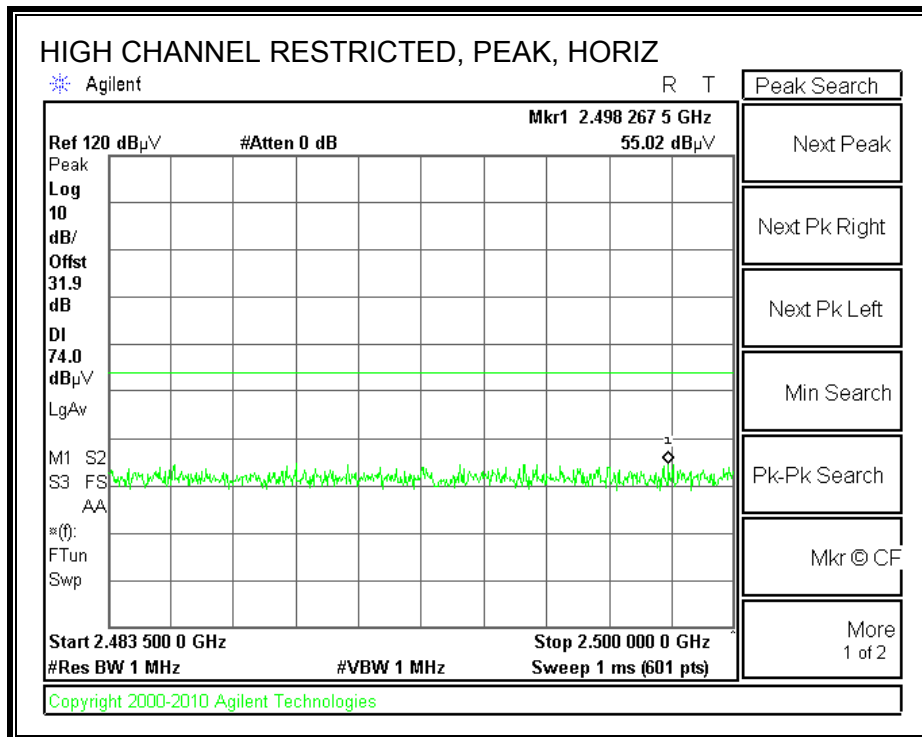
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



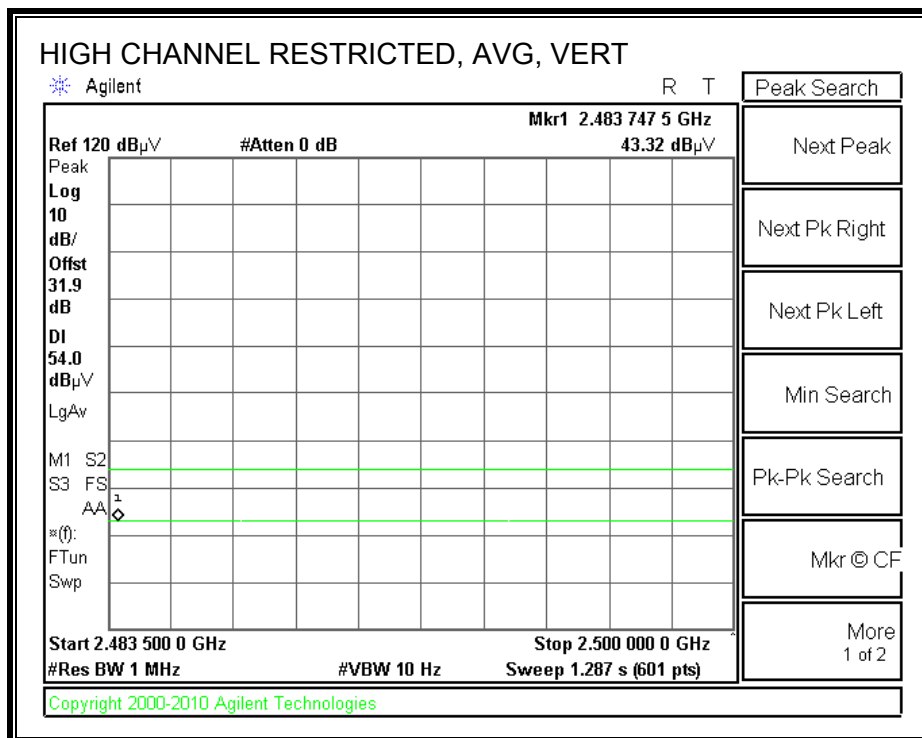
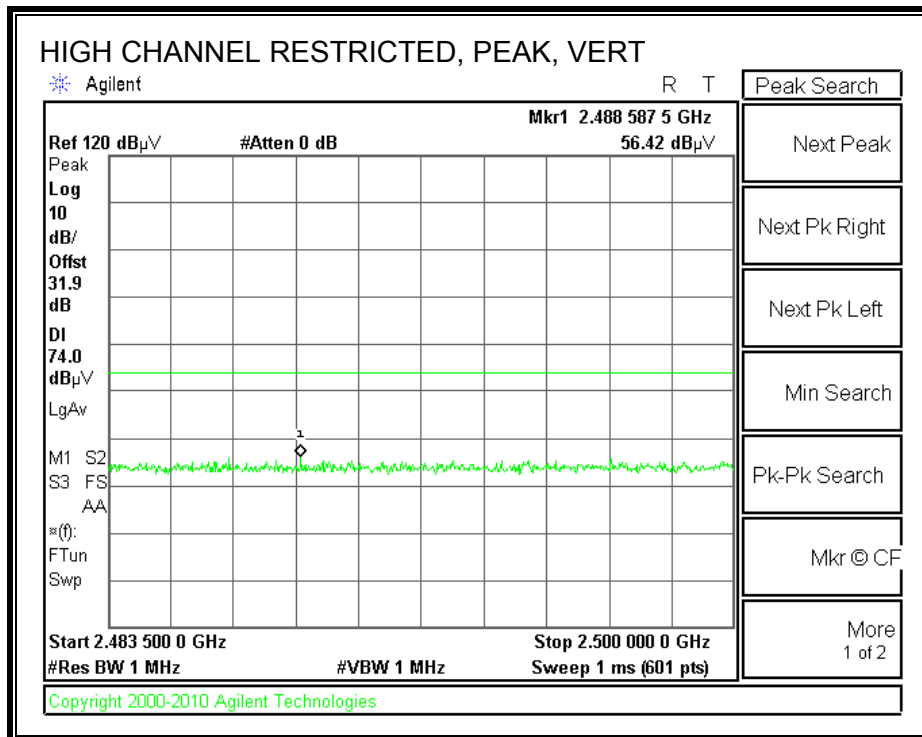
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



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



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



## HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company:		BroadCom Corporation													
Project #:		11U13795													
Date:		6/22/2011													
Test Engineer:		David Garcia													
Configuration:		EUT, Antenna, support Laptop													
Mode:		Tx, 8PSK Mode													
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz				Limit					
T60; S/N: 2238 @3m		T34 HP 8449B				T125; ARA 18-26GHz; S/N:1007				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				R_001							
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)
<b>Harmonics Spurious</b>															
<b>Low Ch 2402 MHz</b>															
4.804	3.0	35.2	24.2	32.7	5.8	-34.8	0.0	0.0	38.8	27.8	74	54	-35.2	-26.2	H
4.804	3.0	37.3	27.1	32.7	5.8	-34.8	0.0	0.0	40.9	30.7	74	54	-33.1	-23.3	V
<b>Mid Ch 2441 MHz</b>															
4.882	3.0	33.2	23.4	32.7	5.8	-34.8	0.0	0.0	36.9	27.1	74	54	-37.1	-26.9	H/Noise Floor
4.882	3.0	35.2	24.1	32.7	5.8	-34.8	0.0	0.0	39.0	27.9	74	54	-35.0	-26.1	V
7.323	3.0	34.2	23.9	35.5	7.3	-34.1	0.0	0.0	42.9	32.5	74	54	-31.1	-21.5	V
<b>High Ch 2480 MHz</b>															
4.960	3.0	36.2	25.1	32.8	5.9	-34.8	0.0	0.0	40.1	29.0	74	54	-33.9	-25.0	H
4.960	3.0	37.1	27.0	32.8	5.9	-34.8	0.0	0.0	41.0	30.9	74	54	-33.0	-23.1	V
7.440	3.0	34.1	23.4	35.6	7.3	-34.1	0.0	0.0	43.0	32.3	74	54	-31.0	-21.7	V
Rev. 07.22.09															
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										

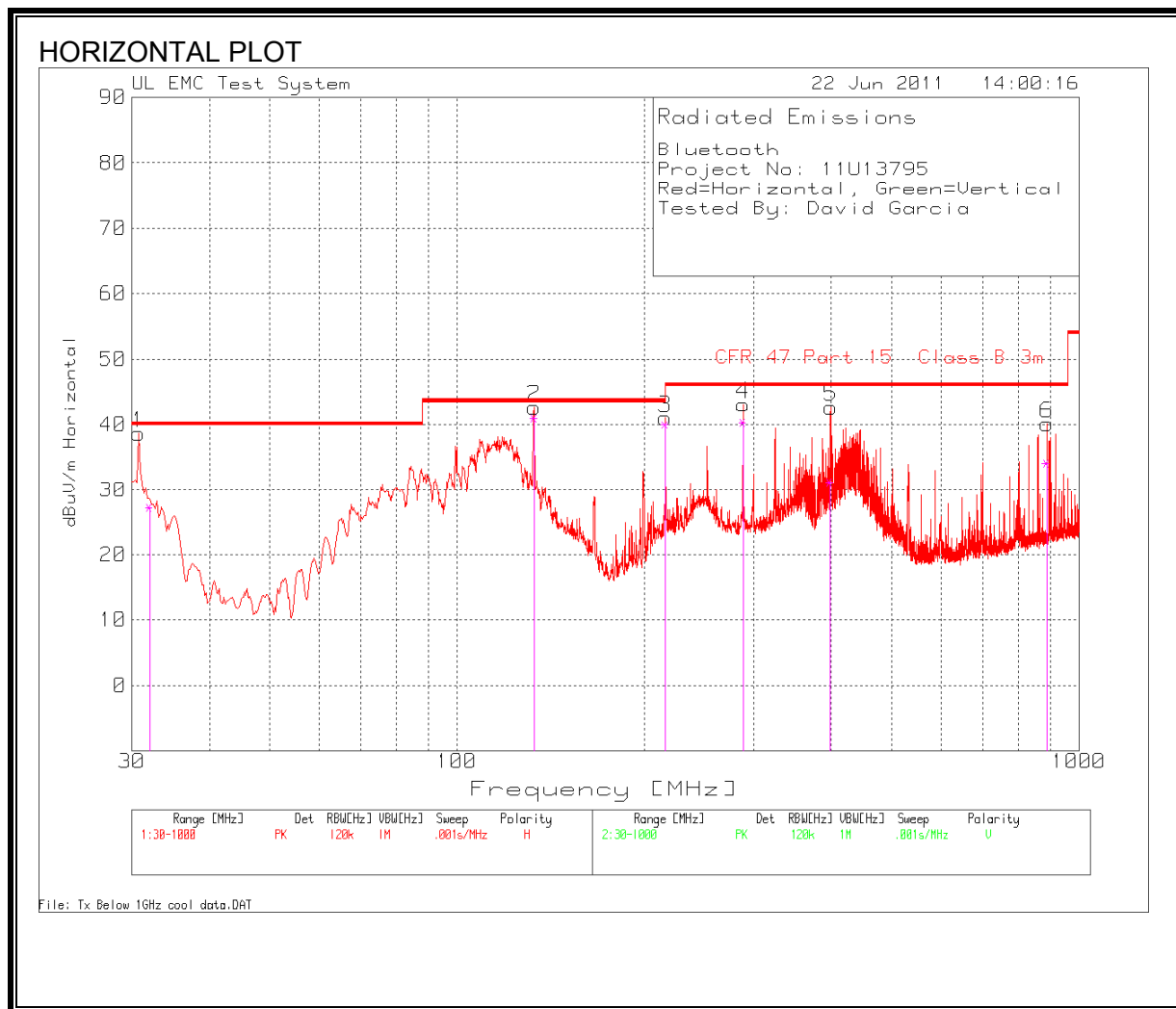


## 8.1. WORST-CASE RECEIVER ABOVE 1 GHz

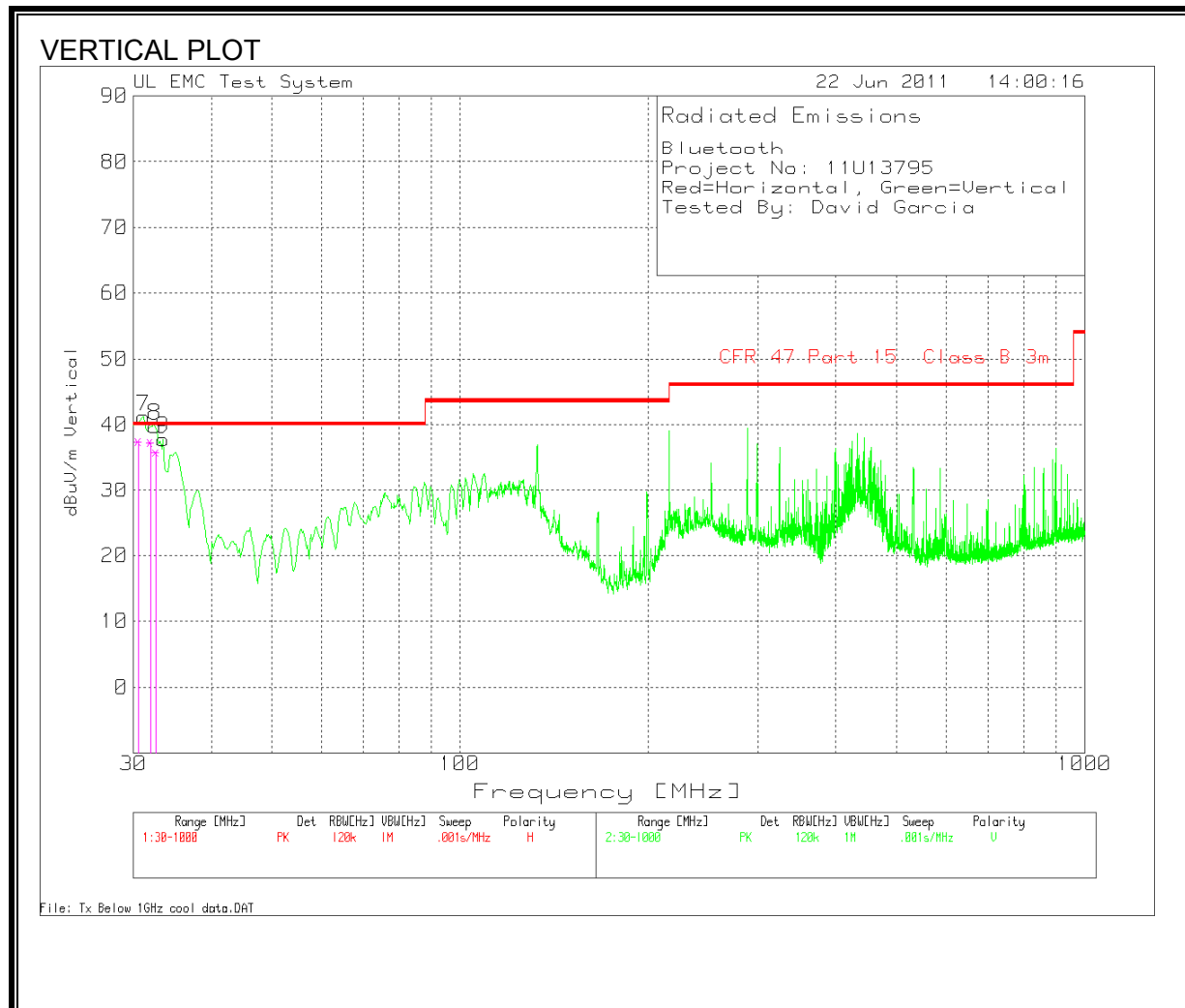
High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company:		BroadCom Corporation													
Project #:		11U13795													
Date:		6/22/2011													
Test Engineer:		David Garcia													
Configuration:		EUT, Antenna, support Laptop													
Mode:		Rx Mode													
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz				Limit					
T60; S/N: 2238 @3m		T34 HP 8449B				T125; ARA 18-26GHz; S/N:1007				RX RSS 210					
Hi Frequency Cables															
3' cable 22807700		12' cable 22807600		20' cable 22807500		HPF		Reject Filter		Peak Measurement RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=1MHz					
3' cable 22807700		12' cable 22807600		20' cable 22807500				R_001							
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Mid Channel, 2441 MHz															
1.013	3.0	46.6	31.6	24.5	2.4	-38.2	0.0	0.0	35.2	20.3	74	54	-38.8	-33.7	H
1.227	3.0	45.5	31.2	25.2	2.6	-37.9	0.0	0.0	35.4	21.1	74	54	-38.6	-32.9	H
2.127	3.0	47.4	30.0	27.9	3.6	-36.7	0.0	0.0	42.1	24.8	74	54	-31.9	-29.2	H
2.687	3.0	42.1	29.0	28.8	4.1	-36.1	0.0	0.0	38.9	25.8	74	54	-35.1	-28.2	H
1.273	3.0	51.4	35.2	25.4	2.7	-37.9	0.0	0.0	41.6	25.4	74	54	-32.4	-28.6	V
1.593	3.0	47.7	32.4	26.4	3.0	-37.4	0.0	0.0	39.7	24.4	74	54	-34.3	-29.6	V
2.133	3.0	48.3	31.8	27.9	3.6	-36.7	0.0	0.0	43.1	26.6	74	54	-30.9	-27.4	V
Rev. 07.22.09															
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. 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 & VERTICAL DATA

Project No: 11U13795											
Red=Horizontal, Green=Vertical											
Tested By: David Garcia											
Test Frequency	Meter Reading	Detector	3m below 1GHz Cable.TX T [dB]	3m T15 PreAmp below 1GHz.TX T [dB]	3m Bilog T185 below 1GHz.TX T [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity	
Horizontal 30 - 1000MHz											
30.7754	46.75	PK	0.6	-28.3	19.6	38.65	40	-1.35	176	Horz	
133.1255	55.78	PK	1.2	-27.9	13.6	42.68	43.5	-0.82	250	Horz	
216.285	55.22	PK	1.5	-27.6	11.9	41.02	46	-4.98	99	Horz	
288.5891	55.6	PK	1.7	-27.3	13.1	43.1	46	-2.9	99	Horz	
399.6623	53.46	PK	2.1	-27.9	15	42.66	46	-3.34	99	Horz	
887.7638	42.83	PK	3.1	-27.7	21.9	40.13	46	-5.87	99	Horz	
Vertical 30 - 1000MHz											
31.1631	49.5	PK	0.6	-28.3	19.4	41.2	40	1.2	101	Vert	
32.52	48.68	PK	0.6	-28.3	18.8	39.78	40	-0.22	101	Vert	
33.4892	47.19	PK	0.6	-28.3	18.3	37.79	40	-2.21	101	Vert	
Test Frequency	Meter Reading	Detector	3m below 1GHz Cable.TX T [dB]	3m T15 PreAmp below 1GHz.TX T [dB]	3m Bilog T185 below 1GHz.TX T [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Azimuth [Degs]	Height [cm]	Polarity
Horizontal 30 - 1000MHz											
32.0594	35.82	QP	0.6	-28.3	19	27.12	40	-12.88	220	199	Horz
133.2327	53.99	QP	1.2	-27.9	13.6	40.89	43.5	-2.61	189	246	Horz
216.4332	54.15	QP	1.5	-27.6	11.9	39.95	46	-6.05	126	146	Horz
288.5677	52.72	QP	1.7	-27.3	13.1	40.22	46	-5.78	56	107	Horz
398.1924	41.94	QP	2.1	-27.9	15	31.14	46	-14.86	131	107	Horz
887.7191	36.77	QP	3.1	-27.7	21.9	34.07	46	-11.93	182	107	Horz
Vertical 30 - 1000MHz											
31.9856	45.9	QP	0.6	-28.3	19	37.2	40	-2.8	50	107	Vert
30.5885	45.34	QP	0.6	-28.3	19.7	37.34	40	-2.66	18	111	Vert
32.6249	44.7	QP	0.6	-28.3	18.7	35.7	40	-4.3	18	108	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: Bluetooth Project No 11U13795.TXT											
File: Tx Below 1GHz cool data.DAT											

## 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.

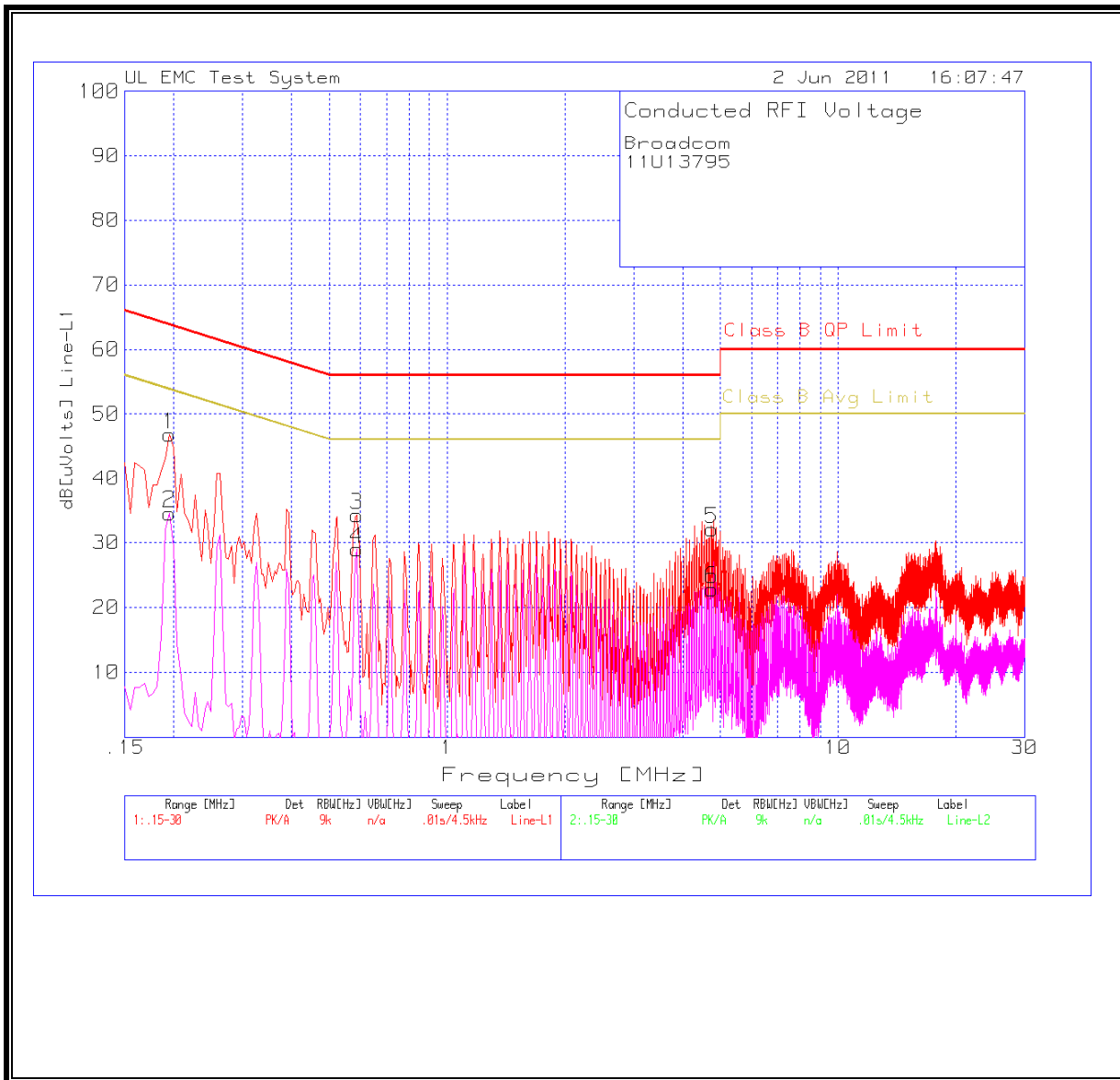
Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

## 6 WORST EMISSIONS

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
0.195	46.84	PK	0	0	46.84	63.8	-16.96	53.8	-6.96
0.195	34.56	Av	0	0	34.56	63.8	-29.24	53.8	-19.24
0.5865	34.25	PK	0	0	34.25	56	-21.75	46	-11.75
0.5865	29.01	Av	0	0	29.01	56	-26.99	46	-16.99
4.749	32.05	PK	0	0	32.05	56	-23.95	46	-13.95
4.749	22.87	Av	0	0	22.87	56	-33.13	46	-23.13
Line-L2 .15 - 30MHz									
Test Frequency	Meter Reading	Detector	LISN [dB]	Conducted Emission Cable [dB]	dB[uVolts]	Class B QP Limit	Margin	Class B Avg Limit	Margin
0.195	48.51	PK	0	0	48.51	63.8	-15.29	53.8	-5.29
0.195	35.39	Av	0	0	35.39	63.8	-28.41	53.8	-18.41
0.5235	35.05	PK	0	0	35.05	56	-20.95	46	-10.95
0.5235	24.28	Av	0	0	24.28	56	-31.72	46	-21.72
4.749	35.15	PK	0	0	35.15	56	-20.85	46	-10.85
4.749	19.59	Av	0	0	19.59	56	-36.41	46	-26.41

**LINE 1 RESULTS**



**LINE 2 RESULTS**

