



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

**CERTIFICATION TEST REPORT**

**FOR**

**BLUETOOTH MODULE**

**MODEL NUMBER: BT11A**

**FCC ID: ACJ9TGBT11A  
IC: 216A-CFBT11A**

**REPORT NUMBER: 11J13719-1**

**ISSUE DATE: April 12, 2011**

*Prepared for*

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**NVLAP LAB CODE 200065-0**

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** PANASONIC CORPORATION OF NORTH AMERICA  
ONE PANASONIC WAY, 4B-8  
SECAUCUS, NEW JERSEY 07094, U.S.A.

**EUT DESCRIPTION:** BLUETOOTH MODULE

**MODEL:** BT11A

**SERIAL NUMBER:** DFUP1621ZA

**DATE TESTED:** MARCH 16-29, 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:



FRANK IBRAHIM  
EMC SUPERVISOR  
UL CCS

Tested By:



THANH NGUYEN  
EMC ENGINEER  
UL CCS

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 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 a Bluetooth transceiver BT11A

The radio module is manufactured by Alps Electric Co., Ltd..

### 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	14.39	27.48
2402 - 2480	Enhanced 8PSK	12.10	16.22

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an inverted F type antenna, with a maximum gain of 3.69 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was BC 02, rev. 23e.

The EUT driver software installed in the Laptop during testing was BlueSuite, rev. 1.21.

The test utility software used during testing was Bluetooth.exe and BCLiCtrl, rev. 1.19.

### 5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power; therefore, radiated emissions below 1 GHz and power line conducted emissions were performed with EUT set to transmit at the channel with highest output power.

Three orthogonal orientations for the radio module were investigated and X orientation was found to be worst-case; therefore, all final testing was performed with EUT in X orientation.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Panasonic	CF-52MK4DVT1	1BTSA00058	N/A
AC/DC Adapter	Panasonic	CF-AA5713AM1	5713AM110Y05133	N/A

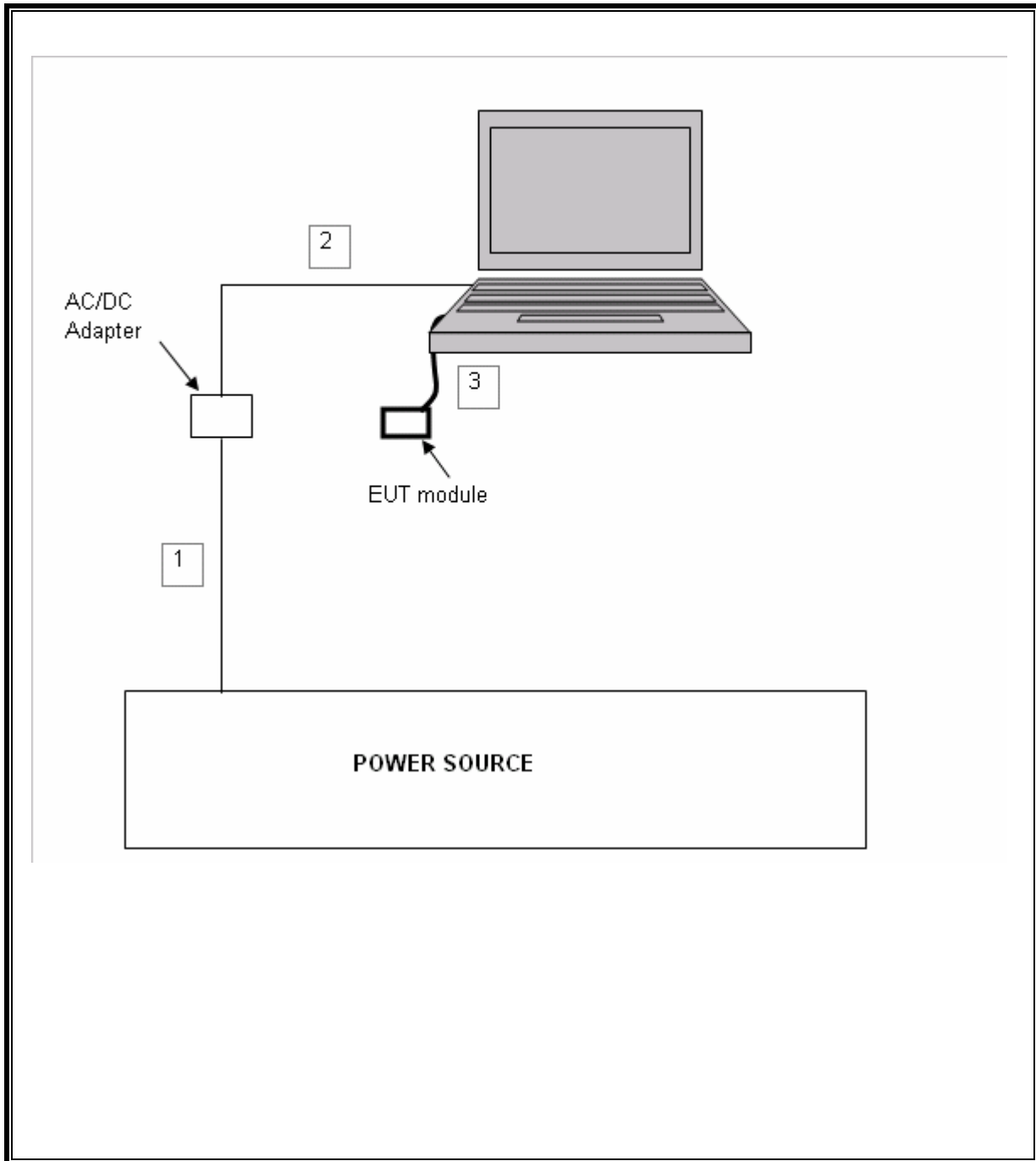
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US1 15VAC	Unshielded	1.8 m	N/A
2	DC	1	DC Plug	Unshielded	1.8 m	N/A
3	External	1	Extended Cable	Unshielded	0.2 m	N/A

### TEST SETUP

The EUT is attached by external cable to a 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
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	12/14/10	12/14/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	12/18/10	12/18/11
PSA Series Spectrum Analyzer	Agilent / HP	E4446A	C01069	01/05/11	01/05/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/05/10	08/05/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/29/10	10/29/11
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/29/10	10/29/11
EMI Receiver	R & S	ESHS 20	N02396	06/08/09	05/06/11
Antenna, Horn, 18 GHz	EMCO	3115	C00945	06/24/10	06/24/11
Antenna, Horn, 26.5 GHz	ARA	SWH-28	C01015	09/29/10	09/29/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	07/14/10	07/14/11
Power meter	HP	437B	C010363	02/08/11	02/08/12
Power Sensor	HP	8481A	226535	02/08/11	02/08/12

## 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.

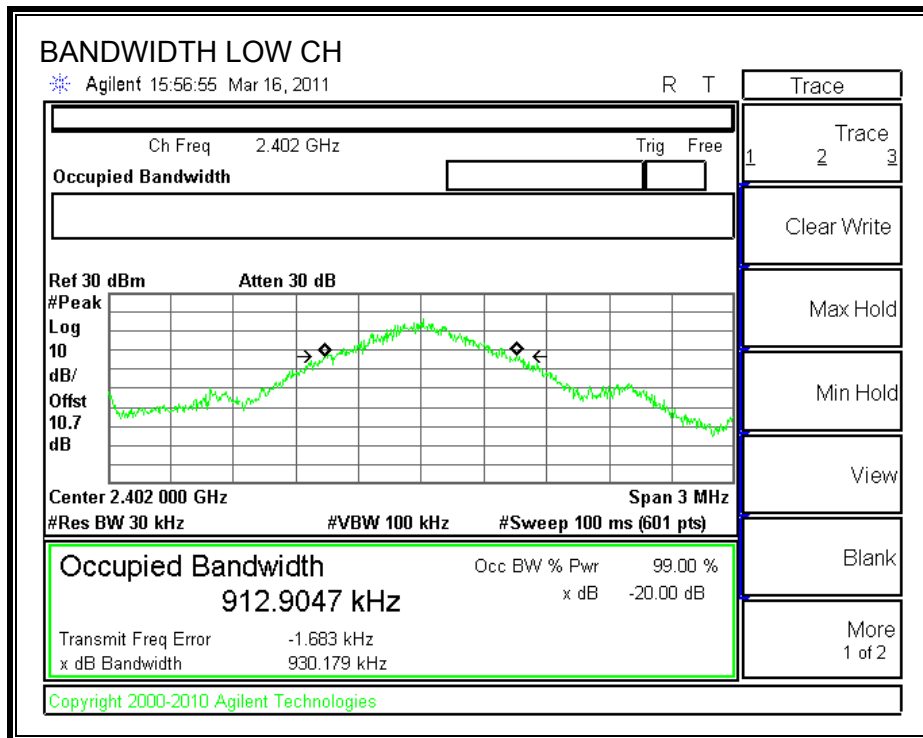
##### TEST PROCEDURE

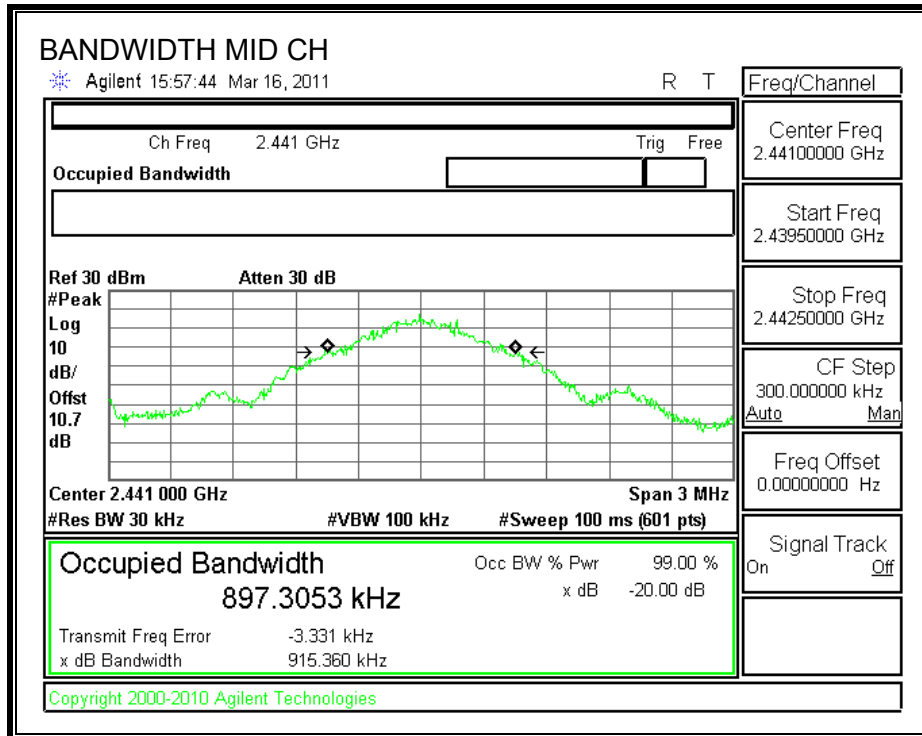
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

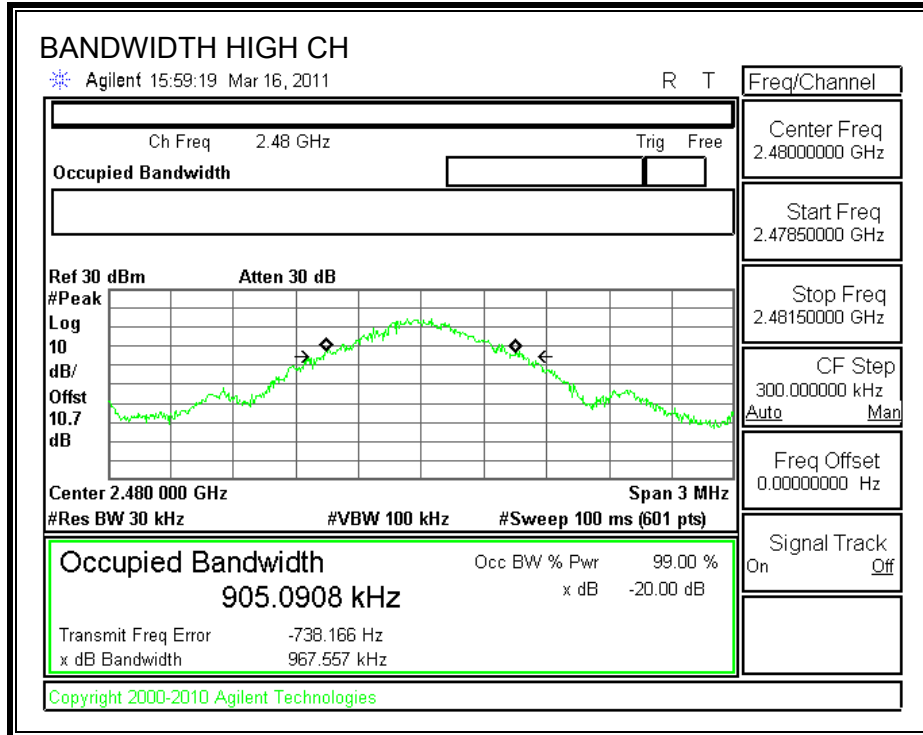
##### RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	930.179	888.8816
Middle	2441	915.360	894.8348
High	2480	967.557	887.9787

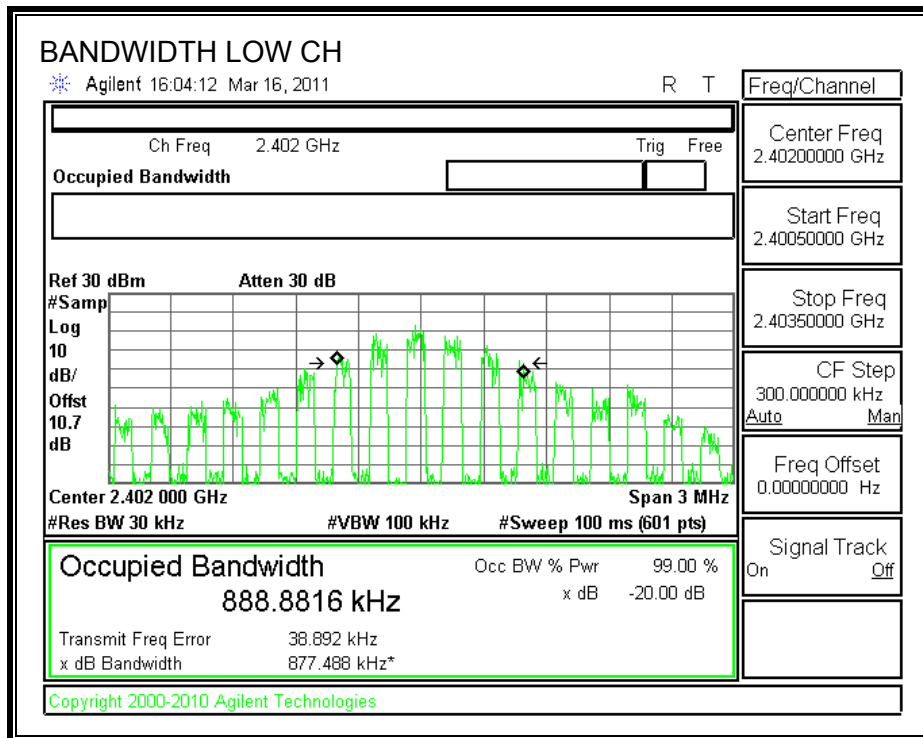
**20 dB BANDWIDTH**

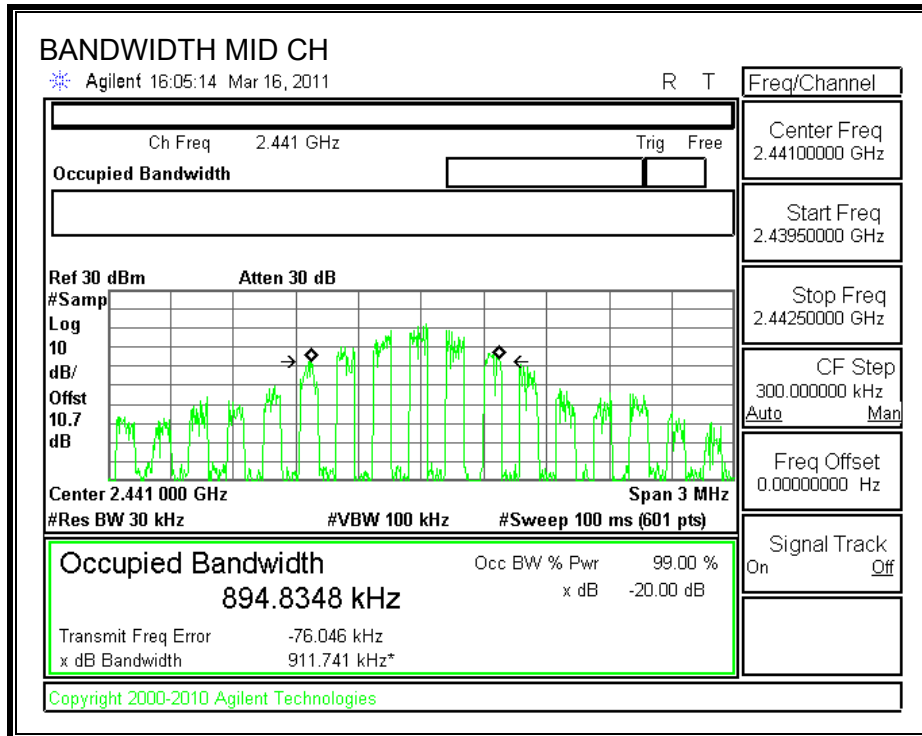


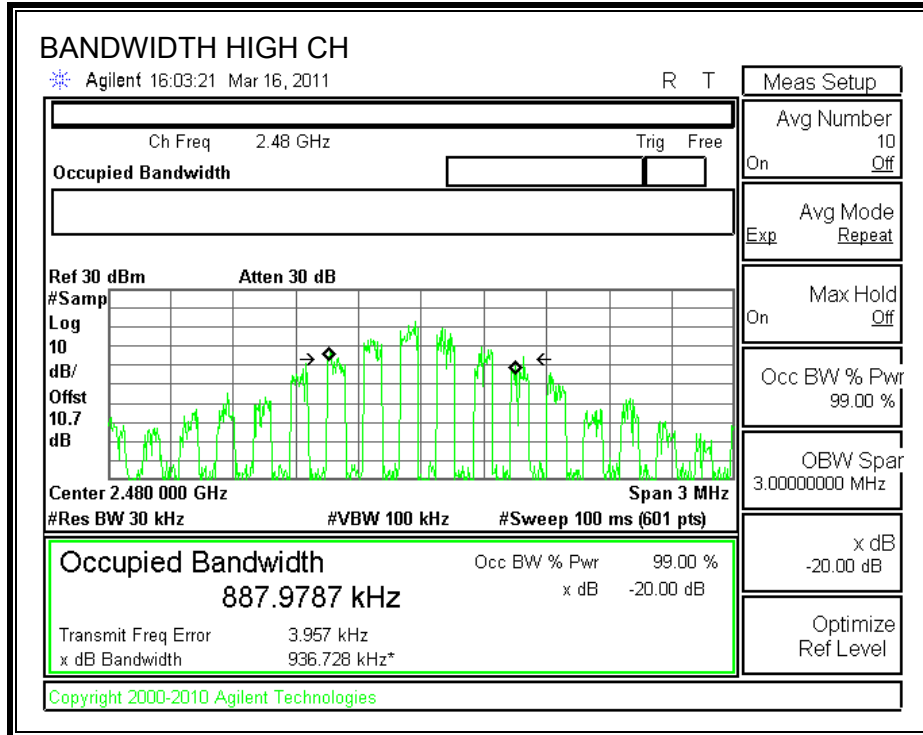




**99% BANDWIDTH**







## 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.

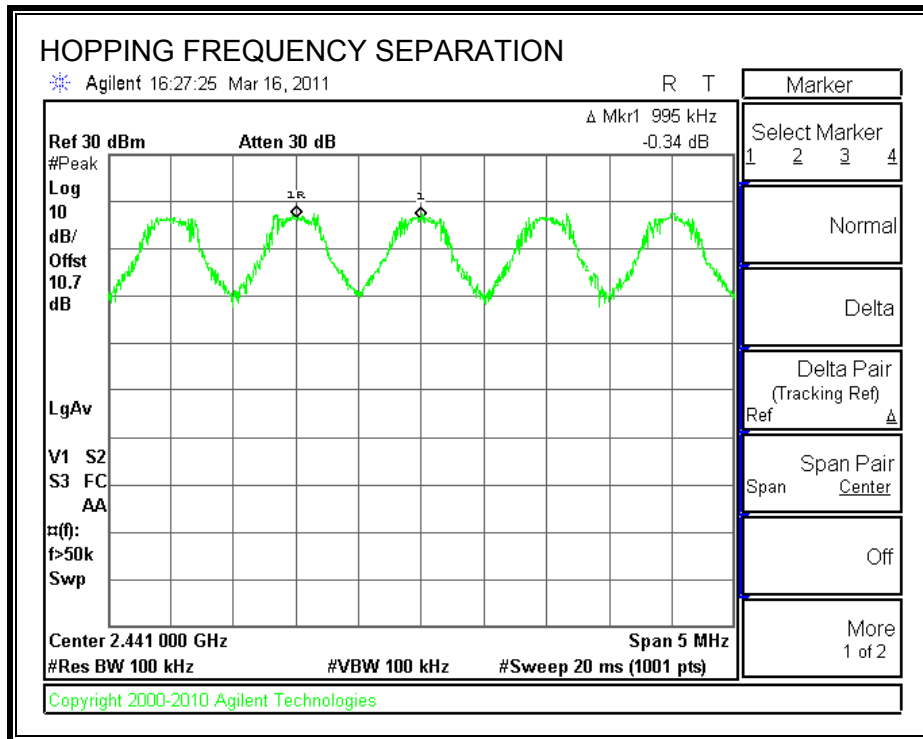
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

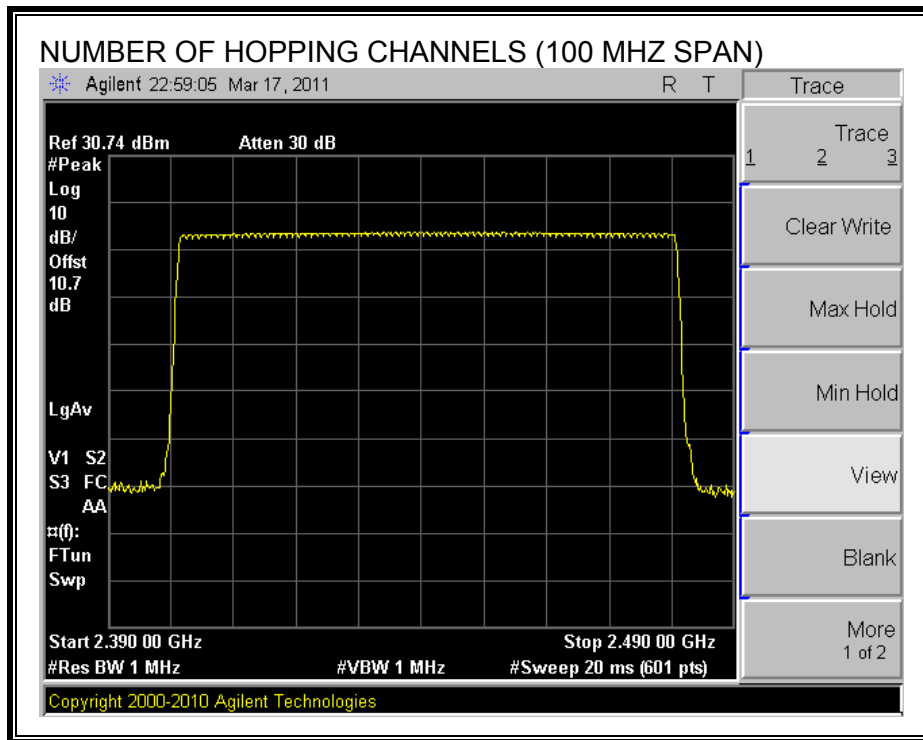
#### **TEST PROCEDURE**

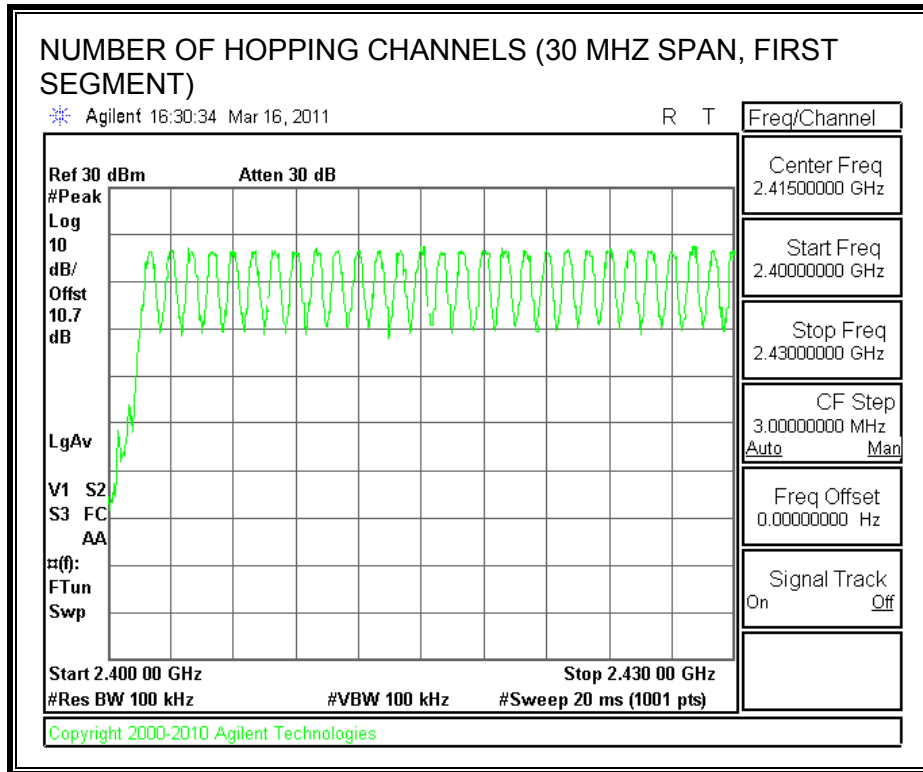
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 100 kHz and VBW is set to 100 kHz. The analyzer is set to Max Hold.

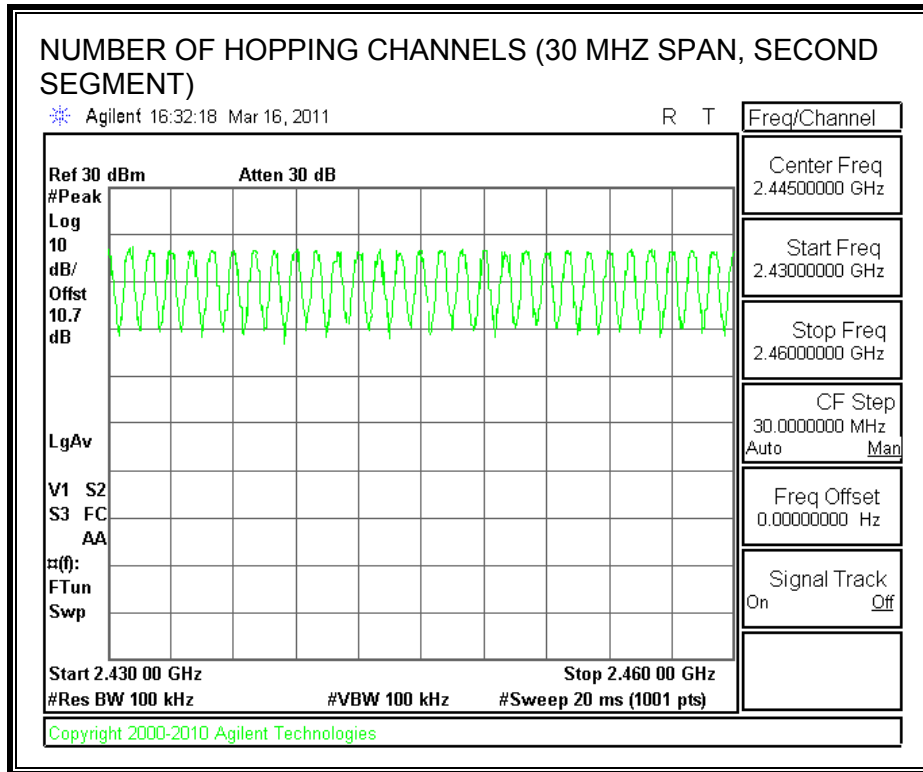
#### **RESULTS**

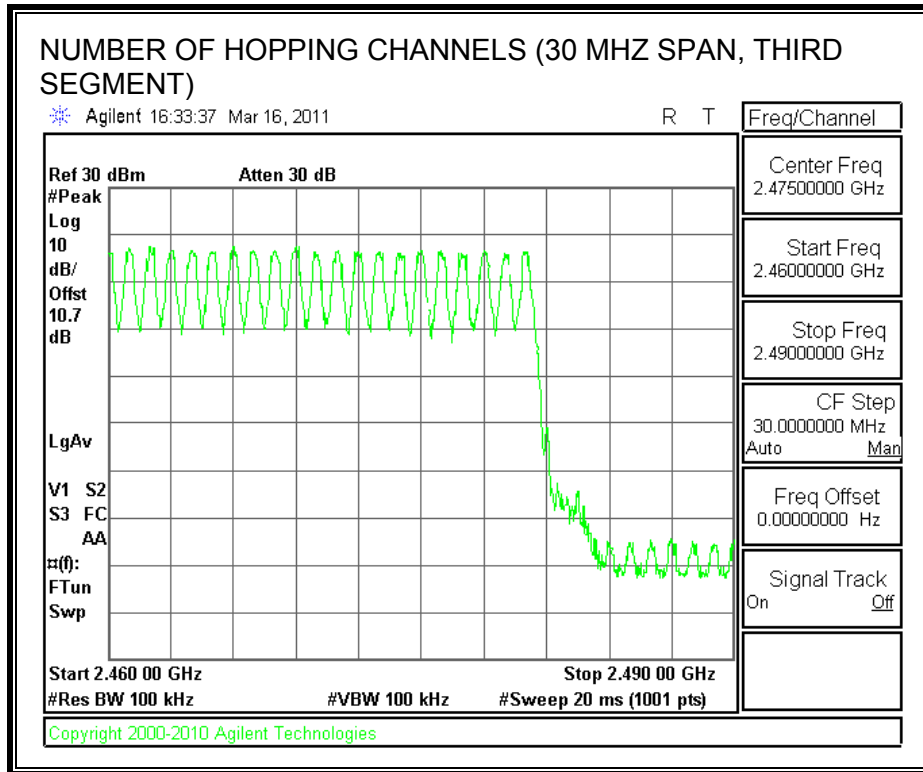
79 Channels observed.

**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 \* (# of pulses in 3.16 s) \* pulse width.

**RESULTS**

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

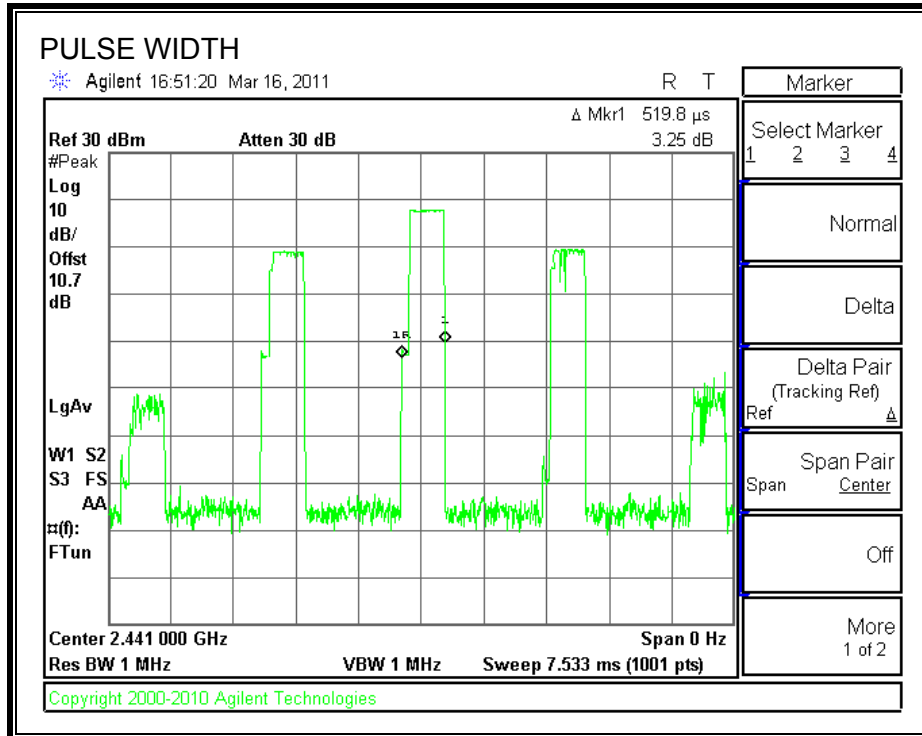
**GFSK Mode**

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.5198	48	0.250	0.4	-0.150
DH3	1.77	12	0.212	0.4	-0.188
DH5	3.02	6	0.181	0.4	-0.219

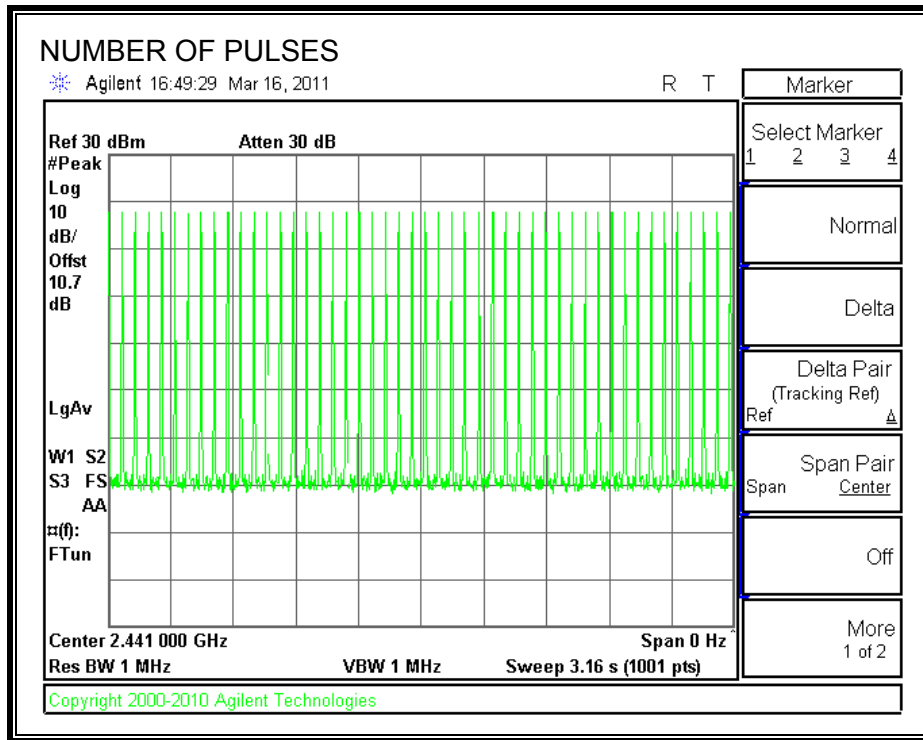
**GFSK MODE**

**DH1**

**PULSE WIDTH**

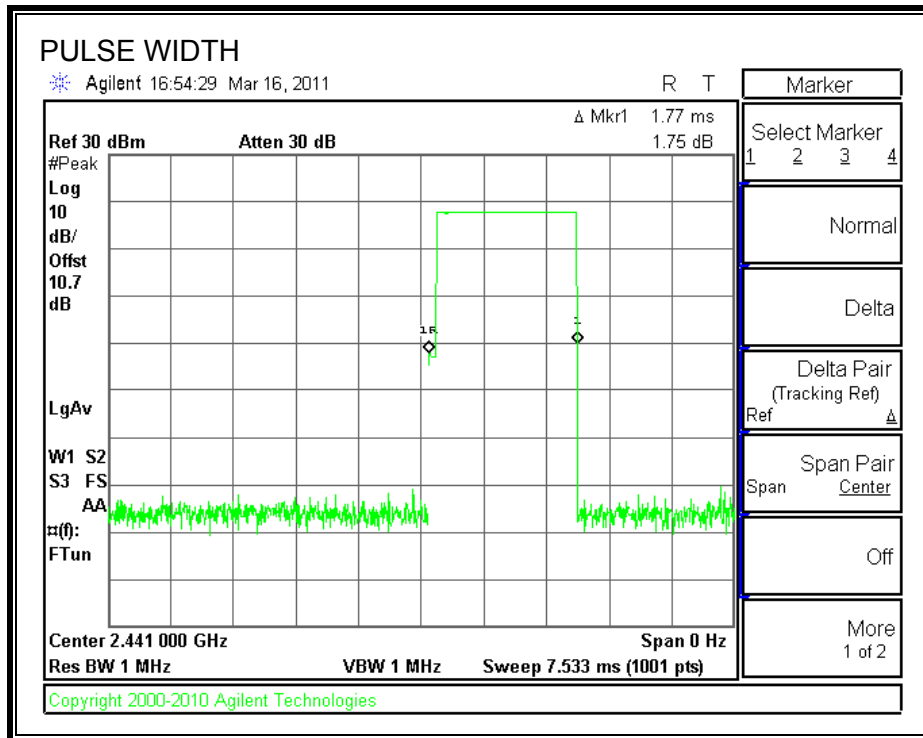


**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

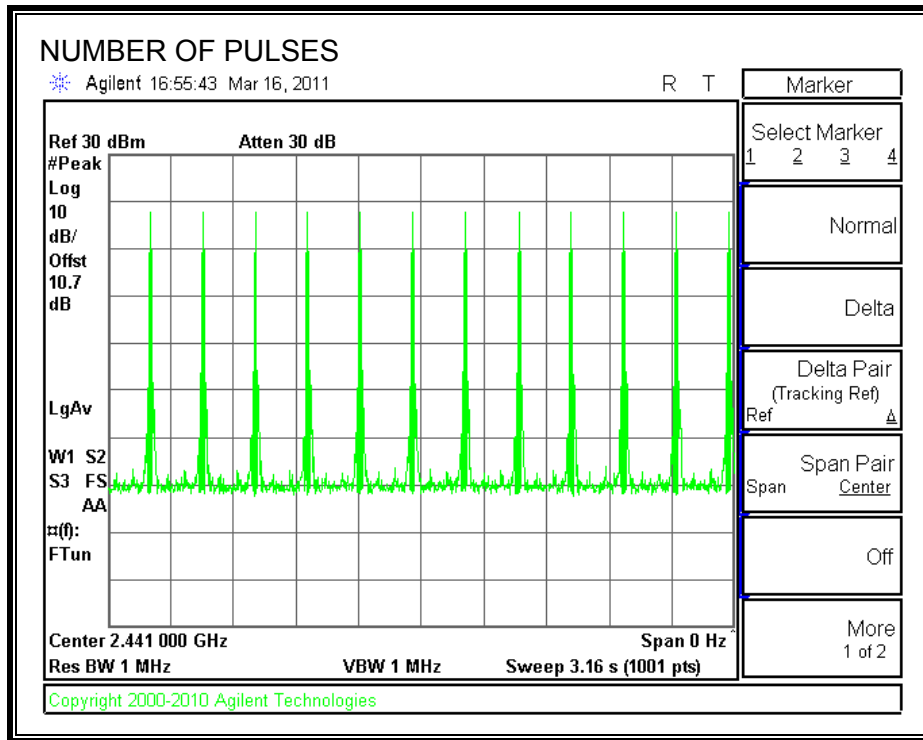


**DH3**

**PULSE WIDTH**

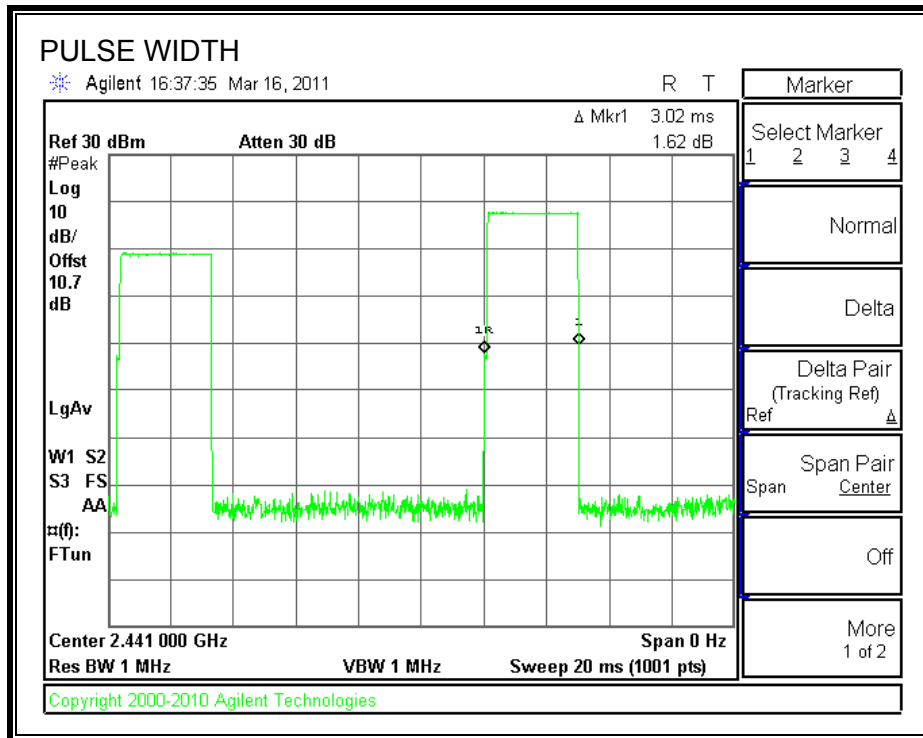


**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

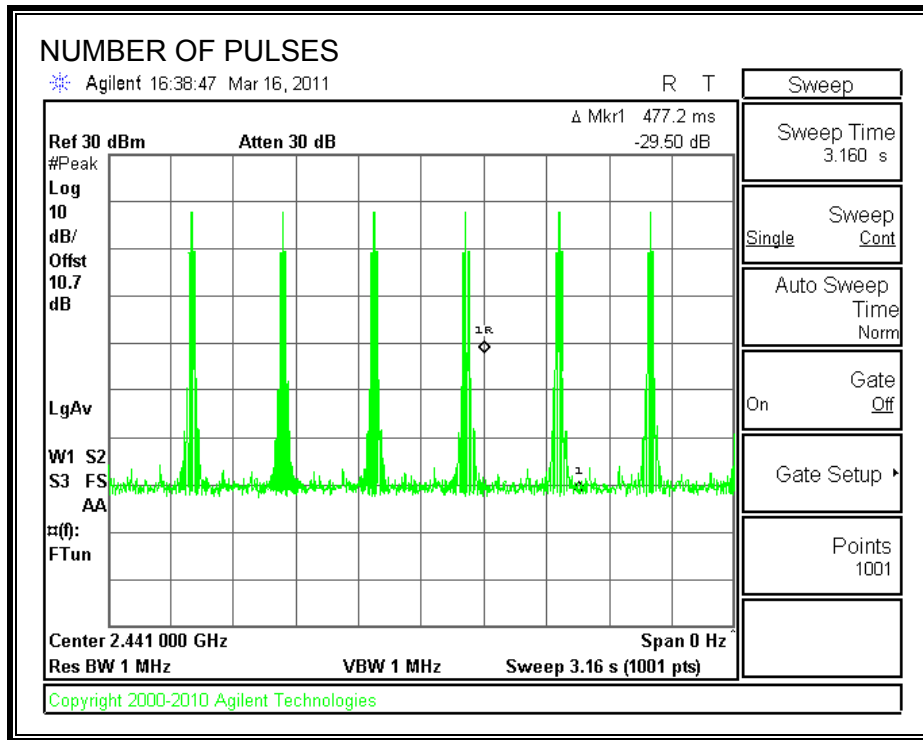


**DH5**

**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.

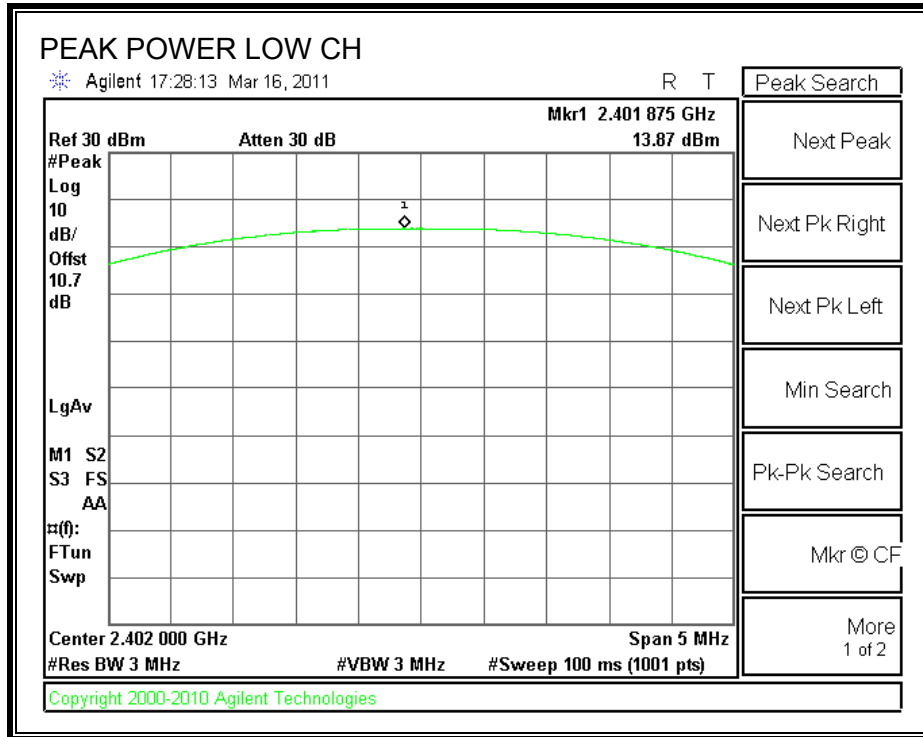
#### TEST PROCEDURE

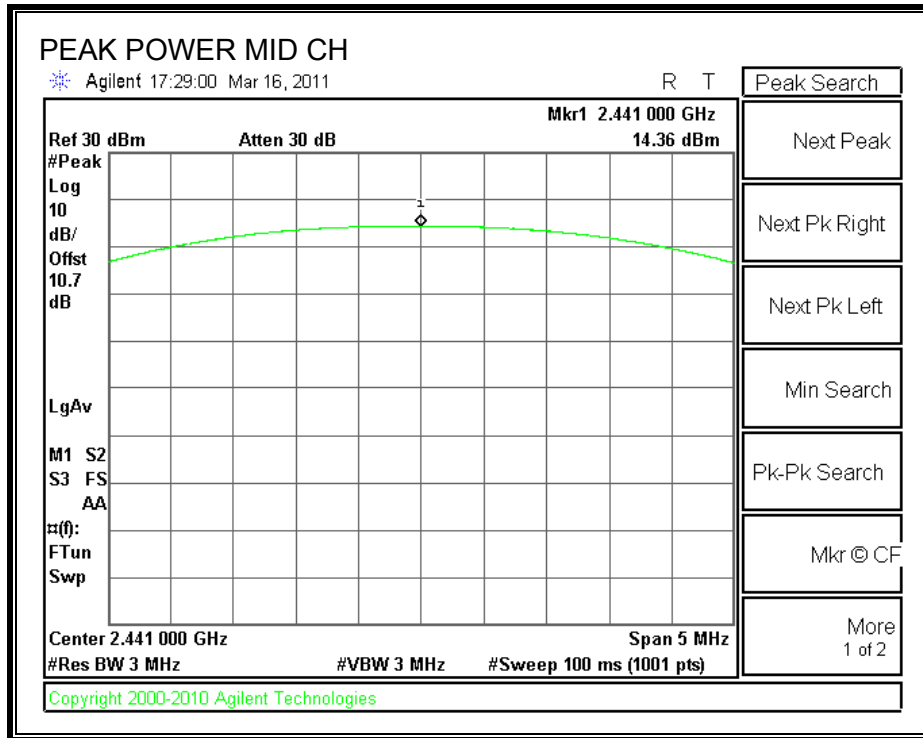
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

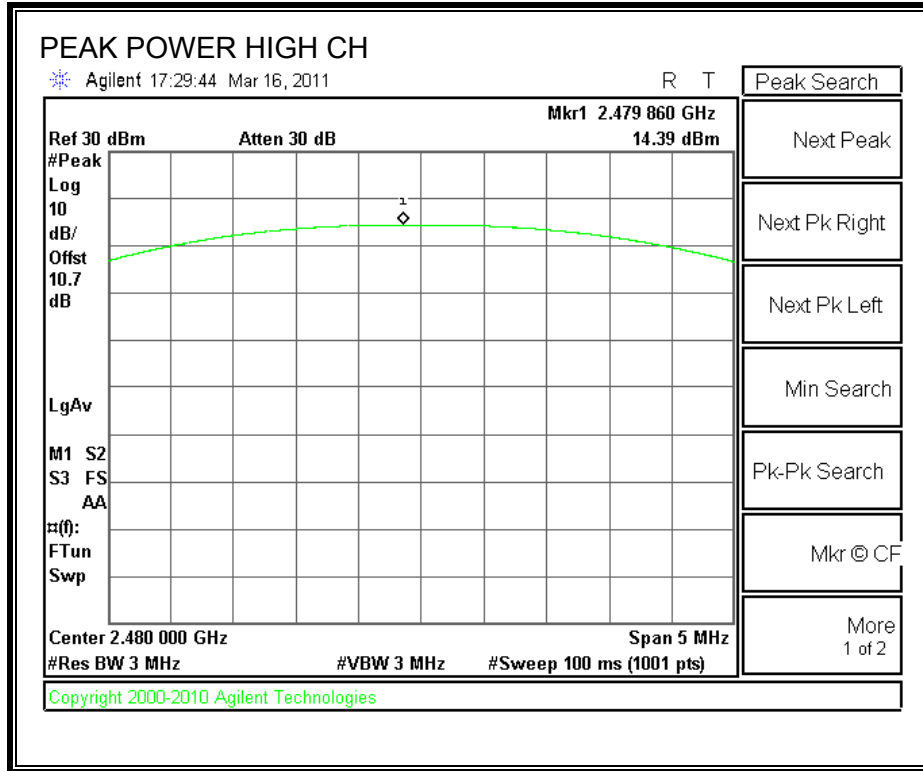
#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	13.87	30	-16.13
Middle	2441	14.36	30	-15.64
High	2480	14.39	30	-15.61

**OUTPUT POWER**







### 7.1.6. AVERAGE POWER

#### LIMIT

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

The cable assembly insertion loss of 10.78 dB (including 10 dB pad and 0.74 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	10.51
Middle	2441	10.93
High	2480	10.61

## 7.1.7. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

### TEST PROCEDURE

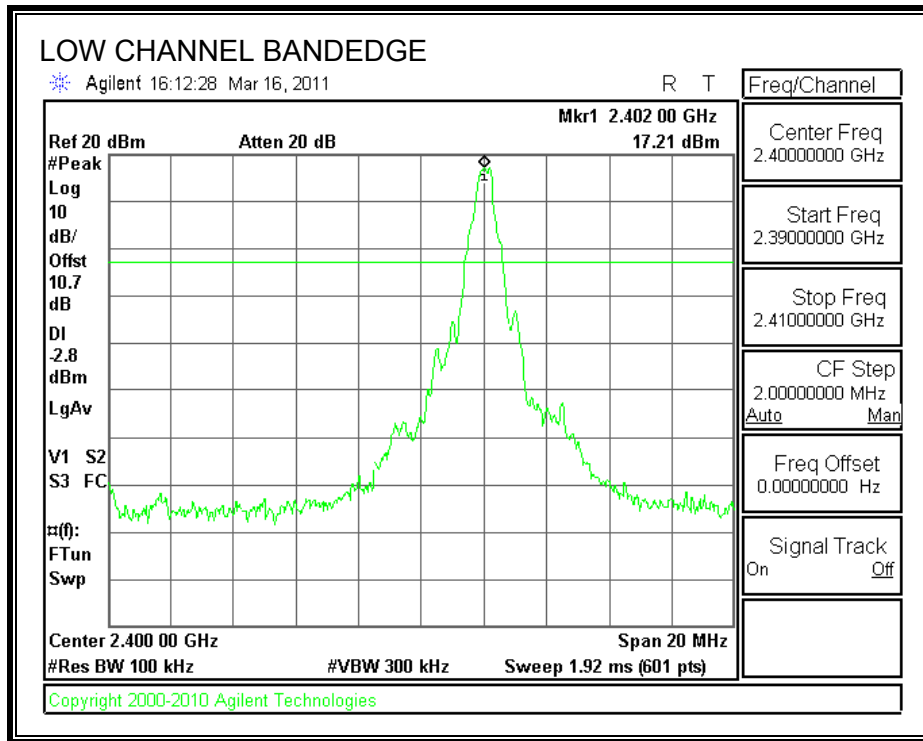
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

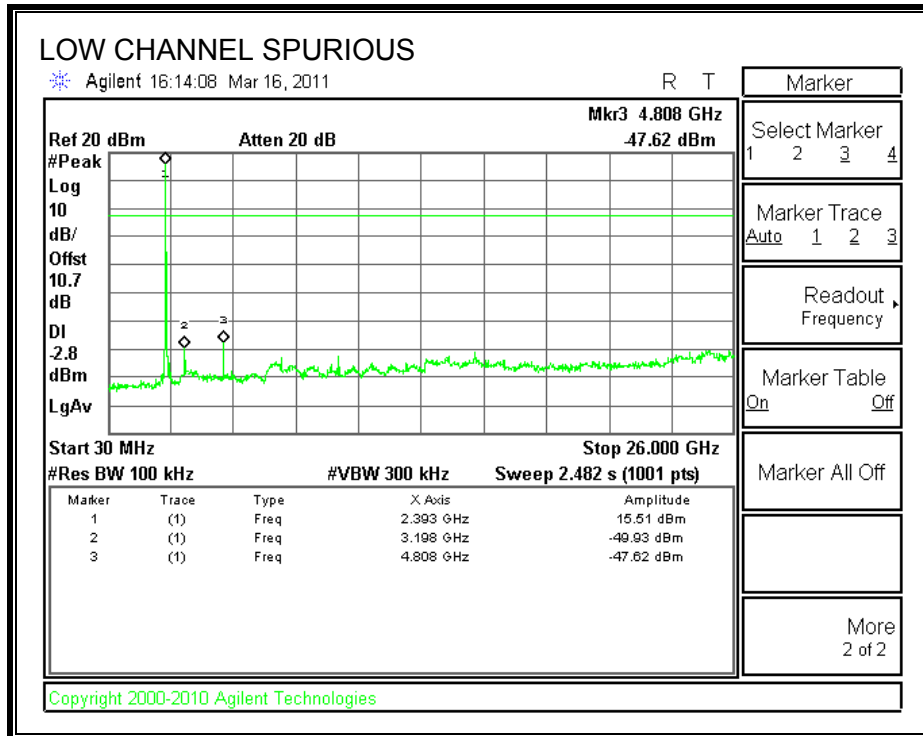
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

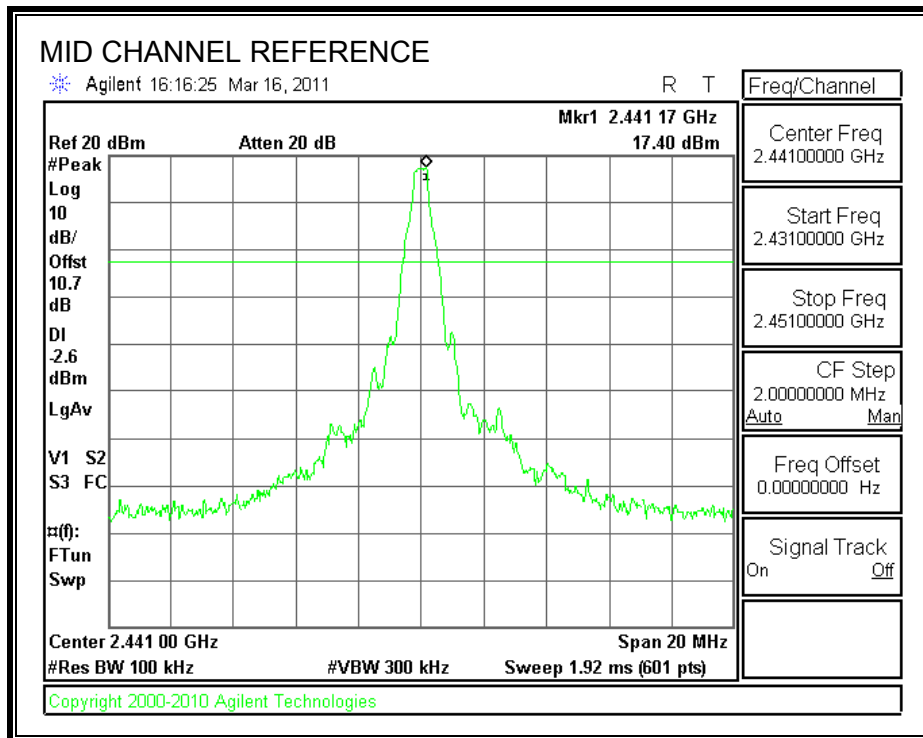
**RESULTS**

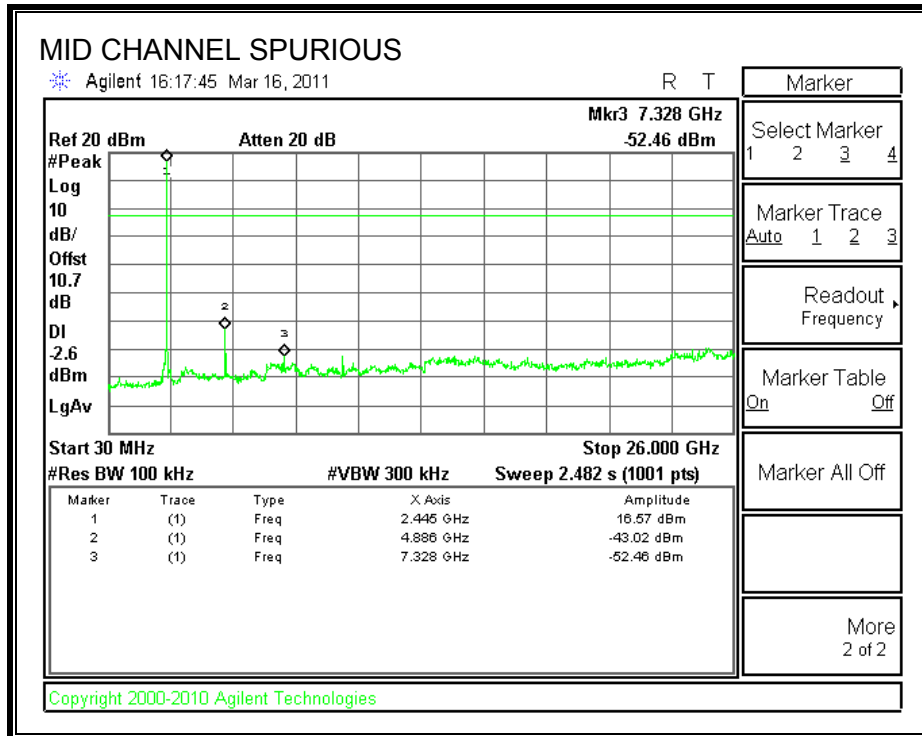
**SPURIOUS EMISSIONS, LOW CHANNEL**



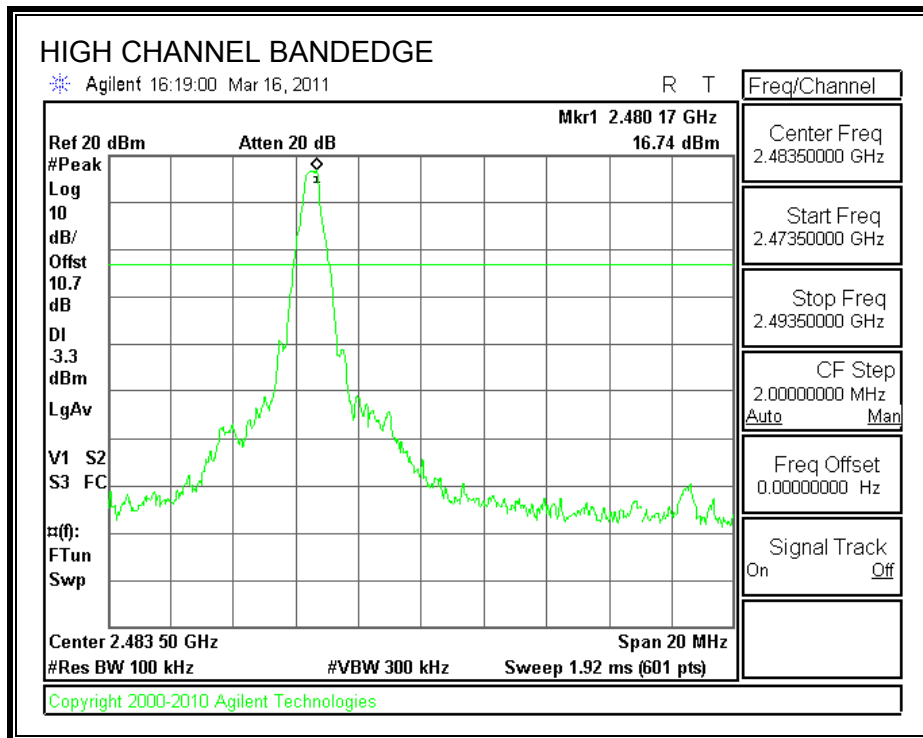


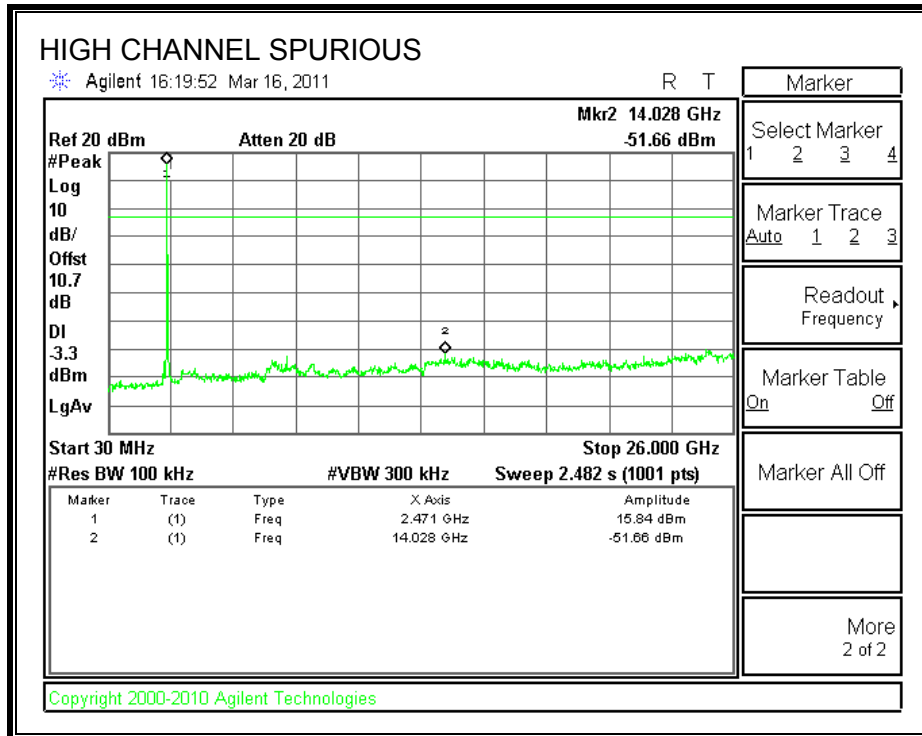
**SPURIOUS EMISSIONS, MID CHANNEL**



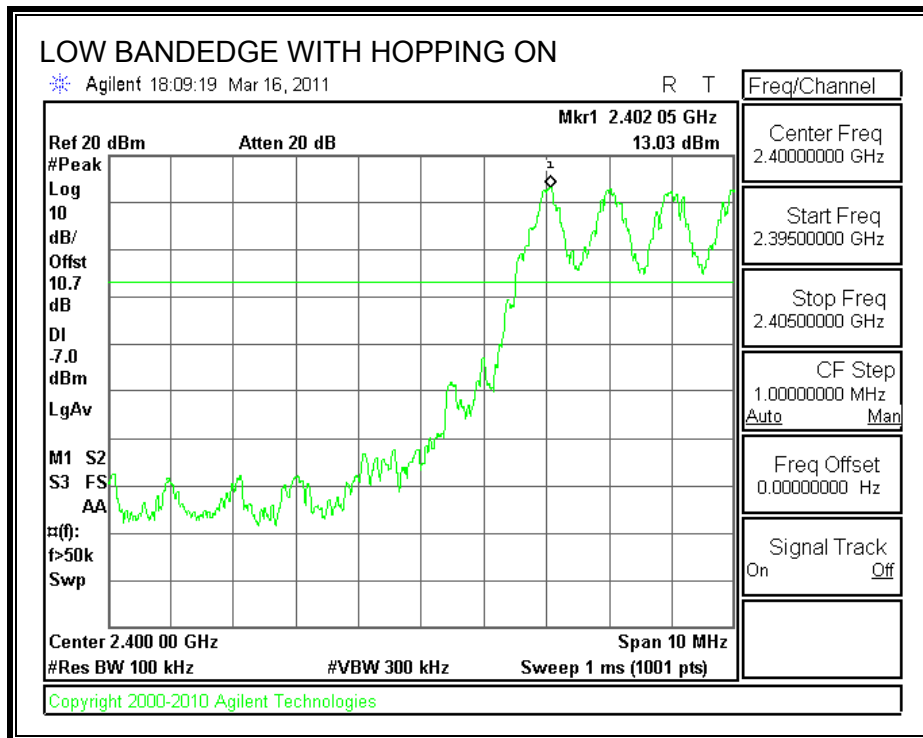


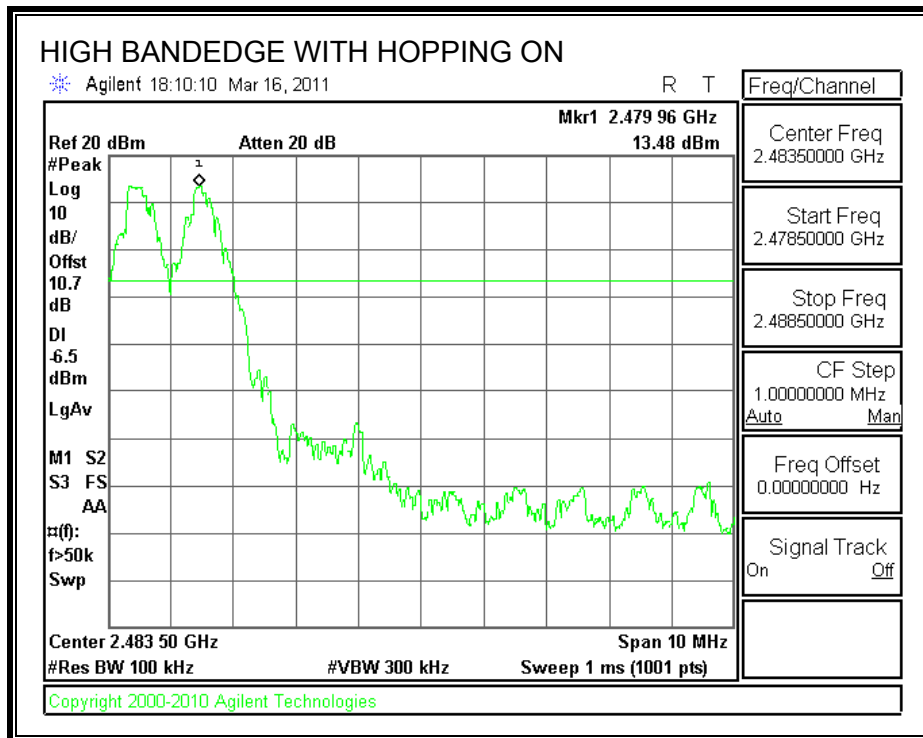
**SPURIOUS EMISSIONS, HIGH CHANNEL**





**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**





## 7.2. ENHANCED DATA RATE 8PSK MODULATION

### 7.2.1. 20 dB AND 99% BANDWIDTH

#### LIMIT

None; for reporting purposes only.

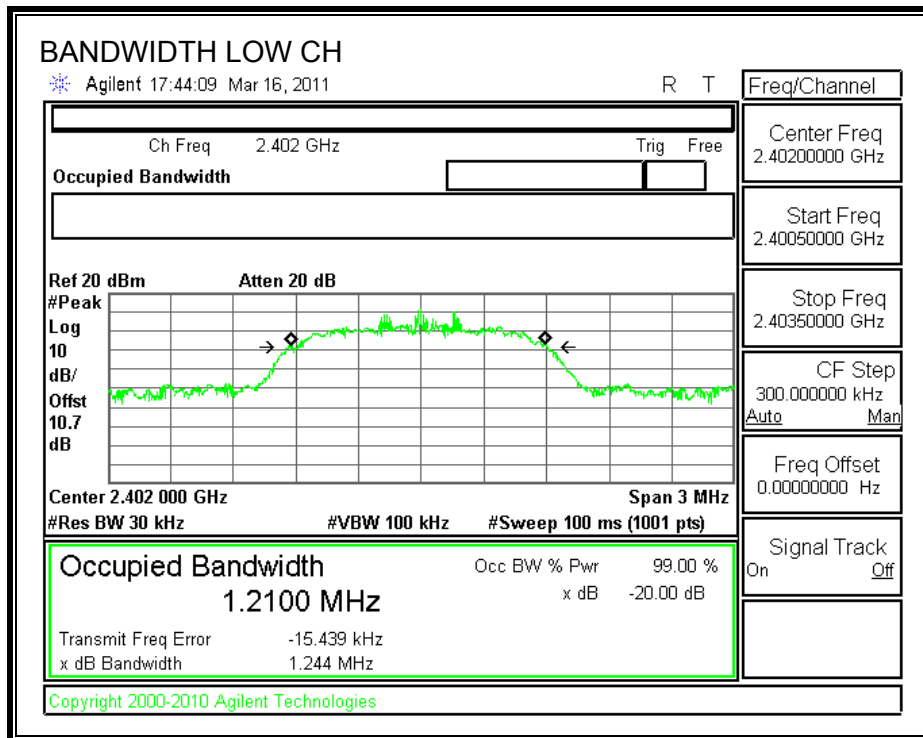
#### TEST PROCEDURE

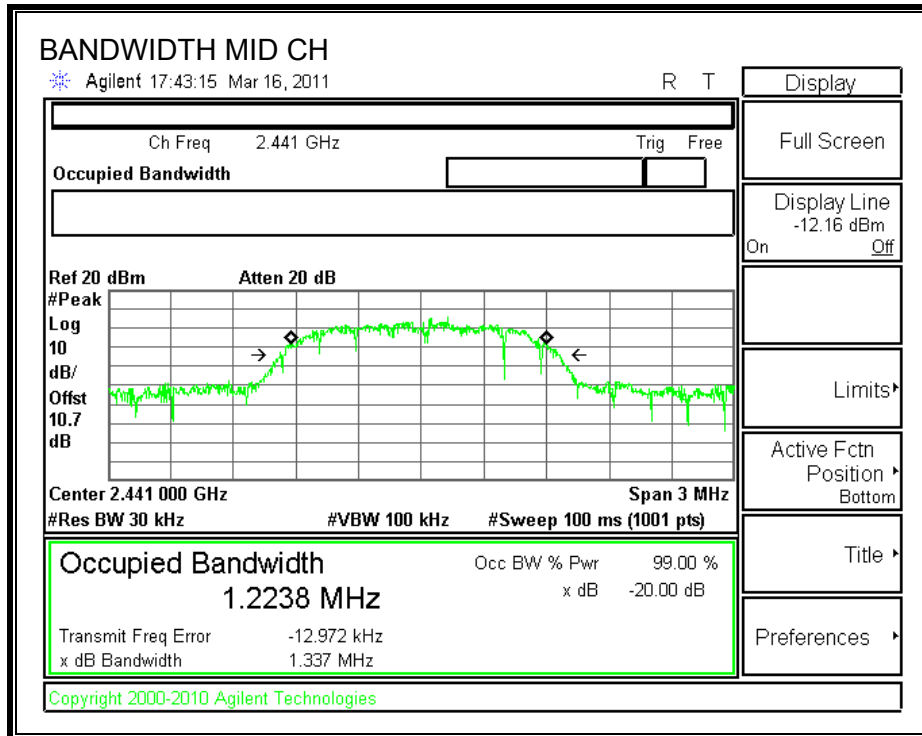
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

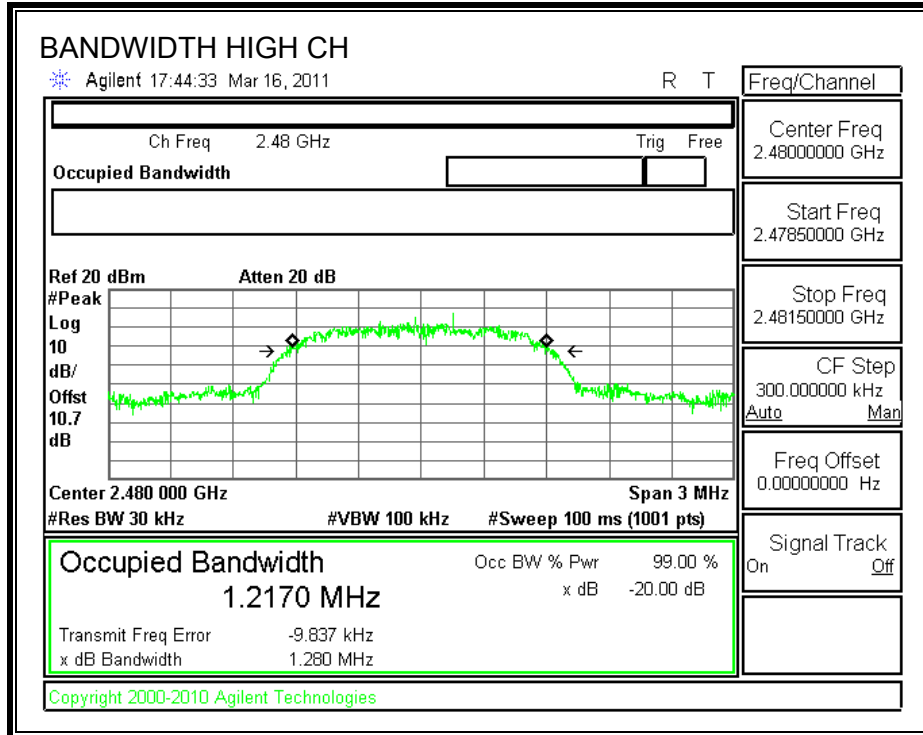
#### RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1244	1229.7
Middle	2441	1337	1221.5
High	2480	1280	1233.9

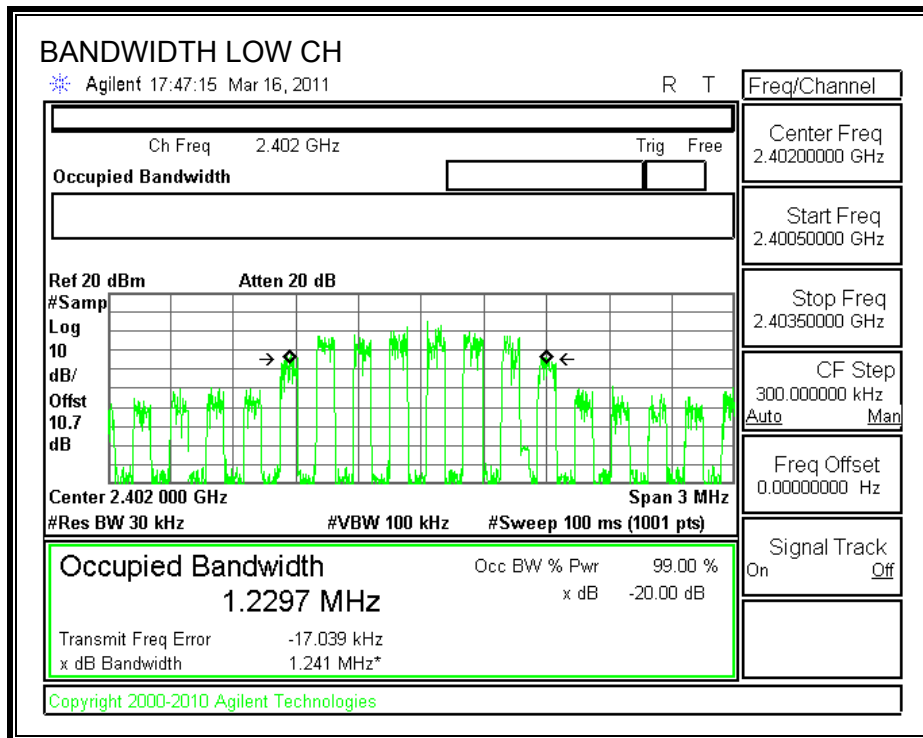
**20 dB BANDWIDTH**

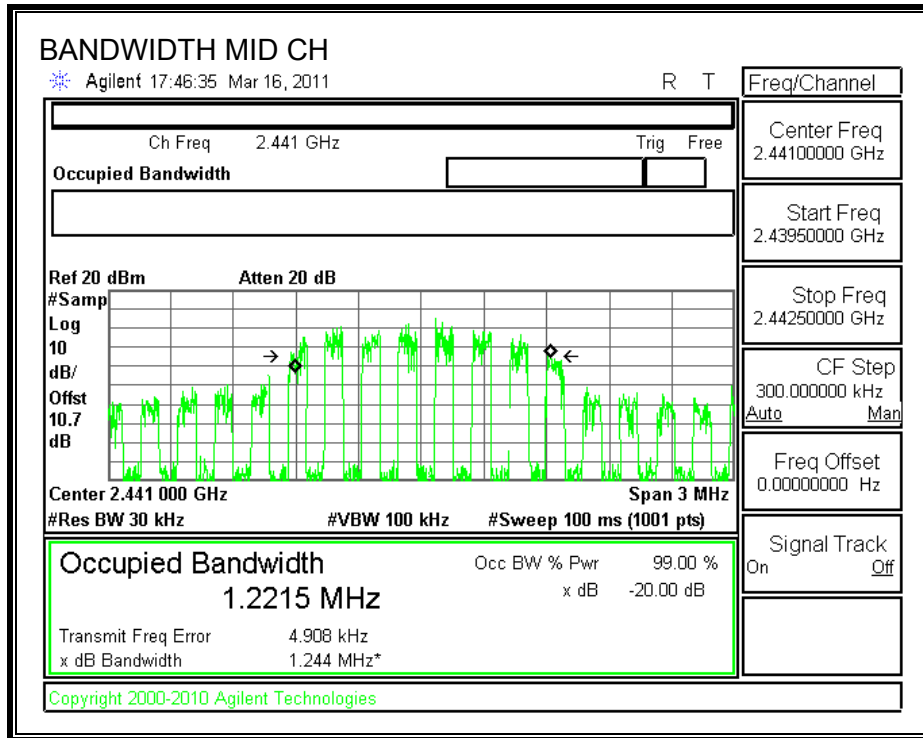


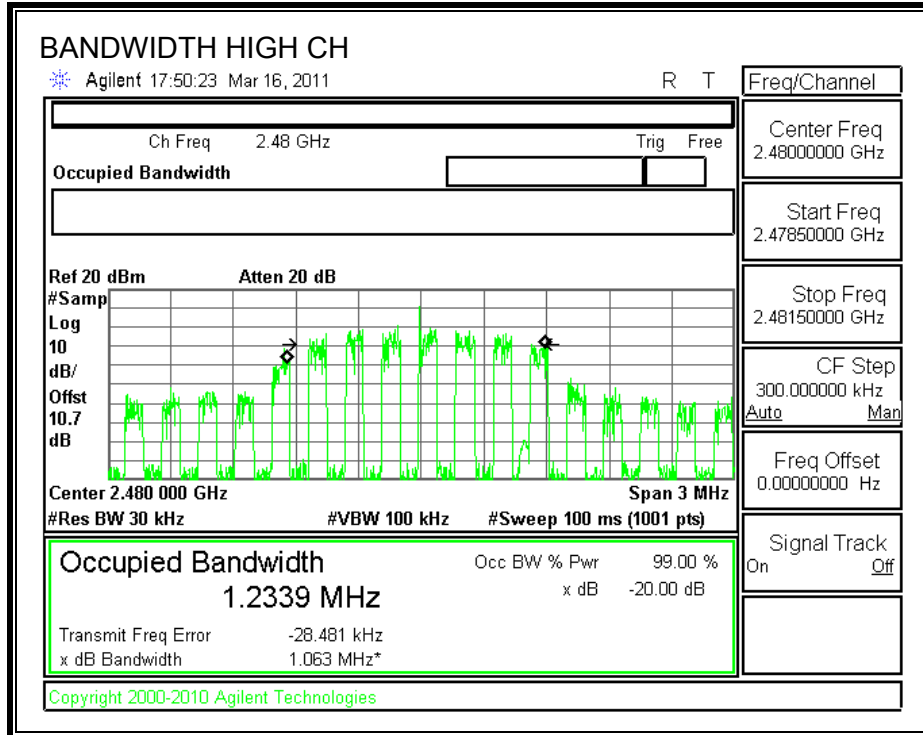




**99% BANDWIDTH**







## 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.

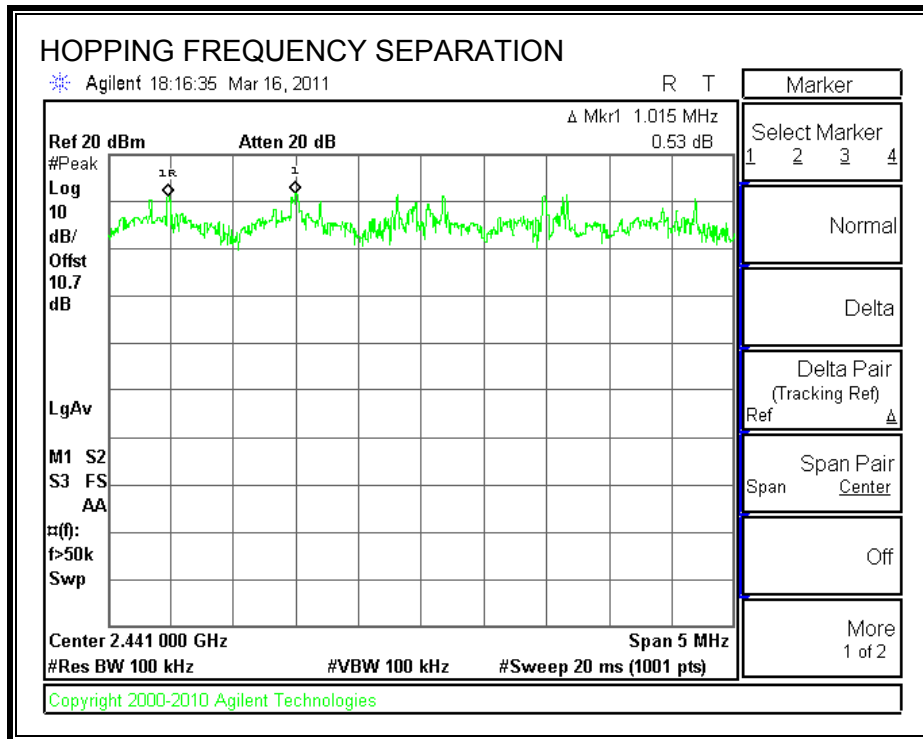
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

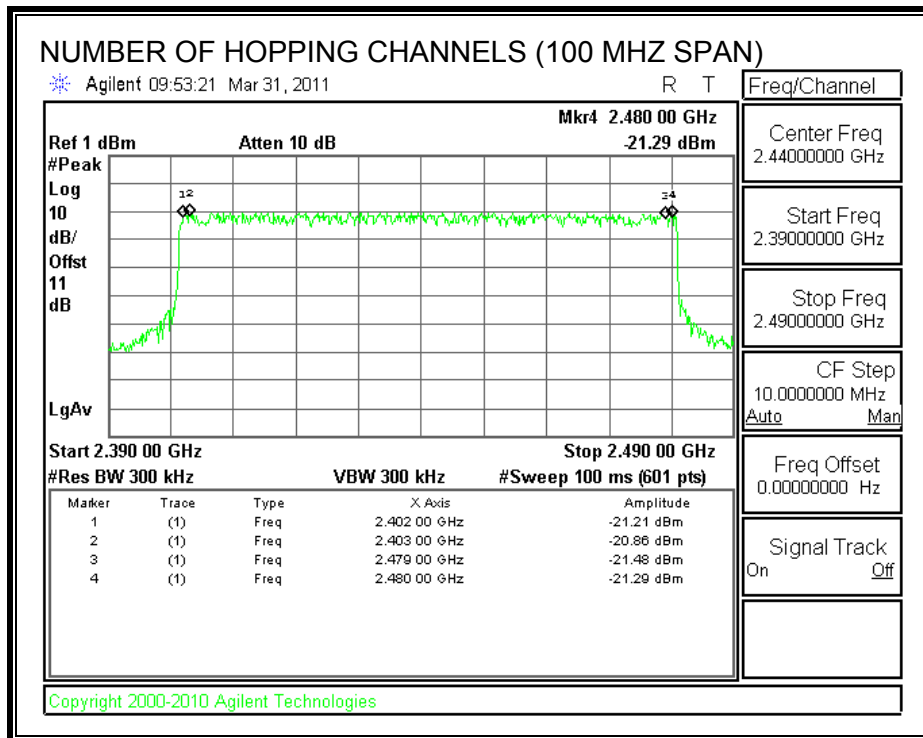
#### **TEST PROCEDURE**

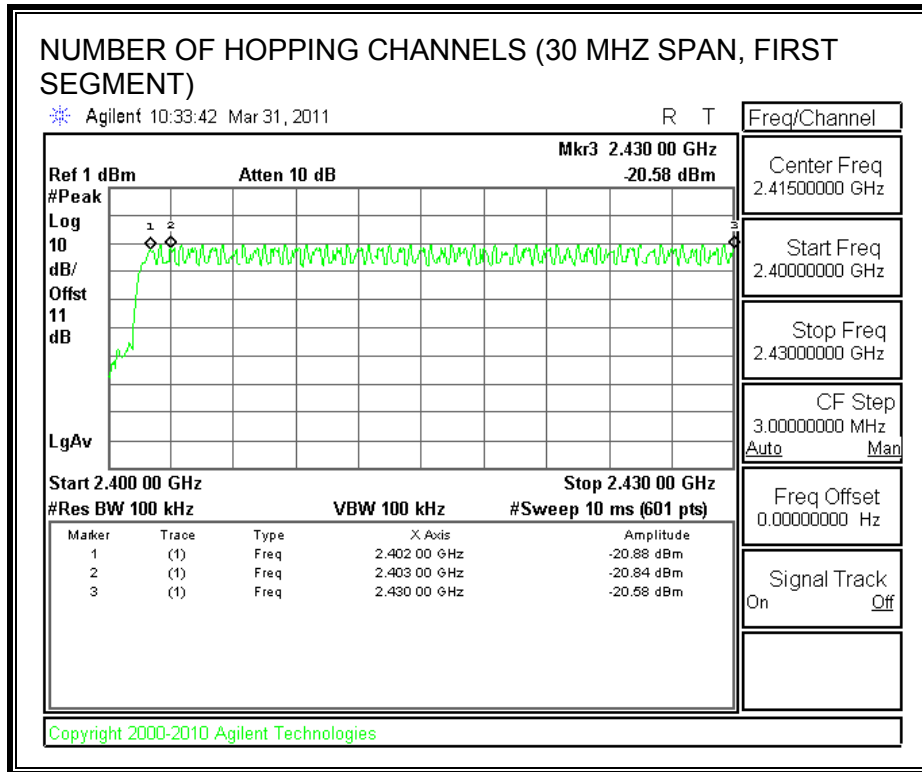
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

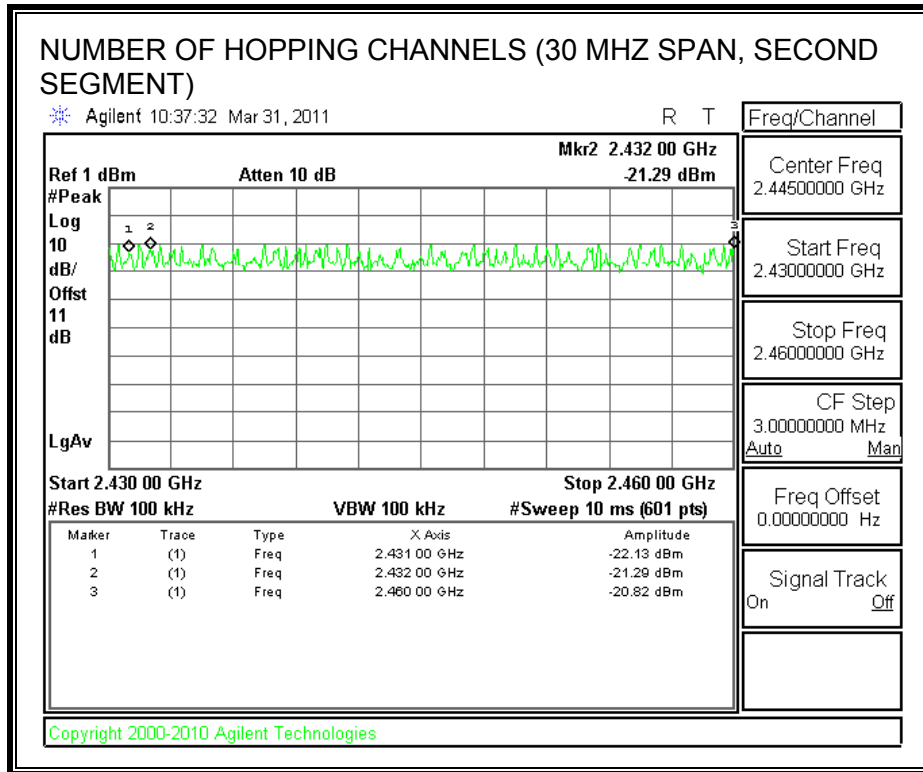
#### **RESULTS**

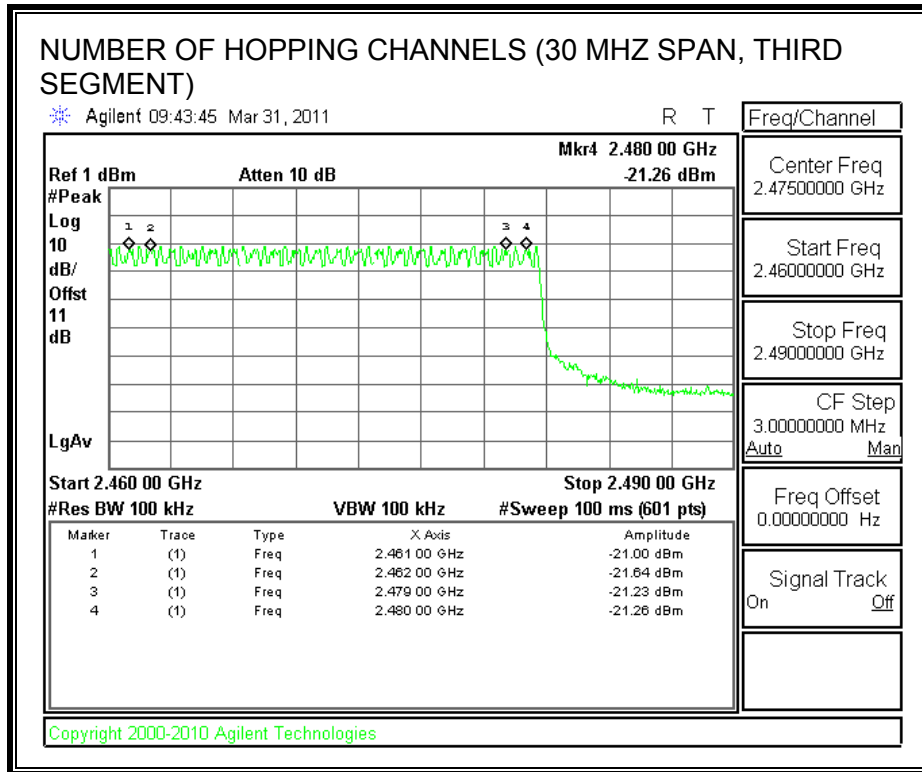
79 Channels observed.

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

#### RESULTS

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

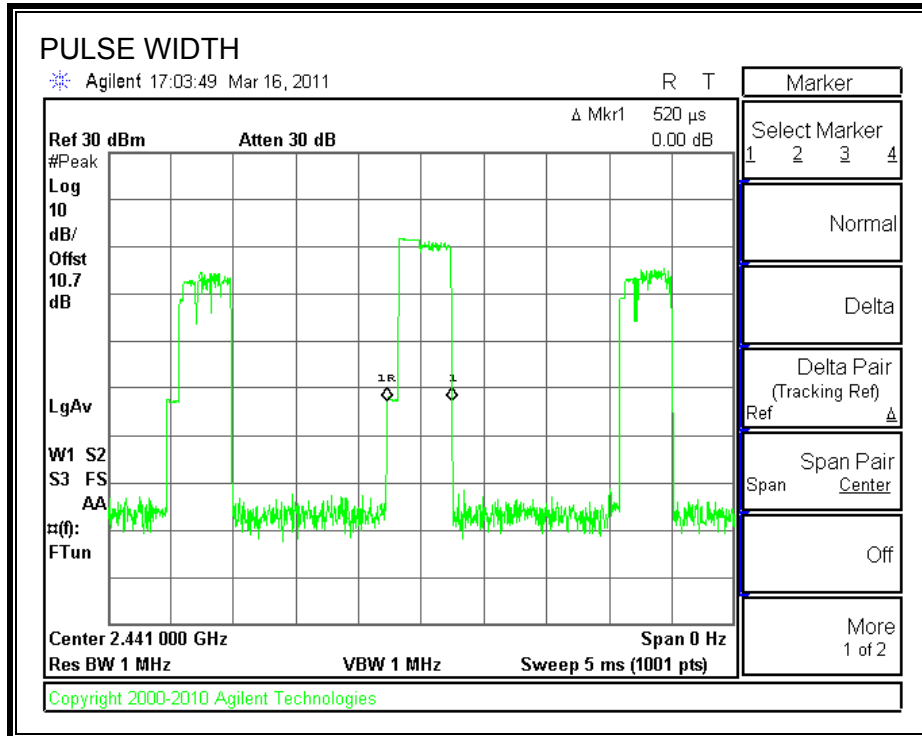
#### 8PSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.52	46	0.239	0.4	0.161
DH3	1.77	12	0.212	0.4	0.188
DH5	3.02	7	0.211	0.4	0.189

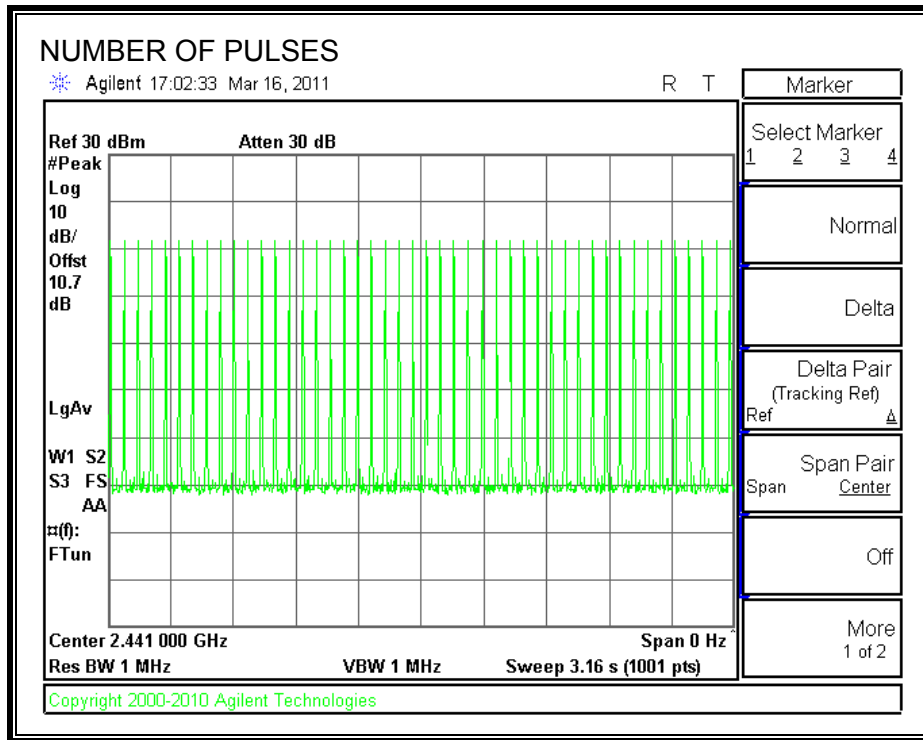
**8PSK MODE**

**DH1**

**PULSE WIDTH**

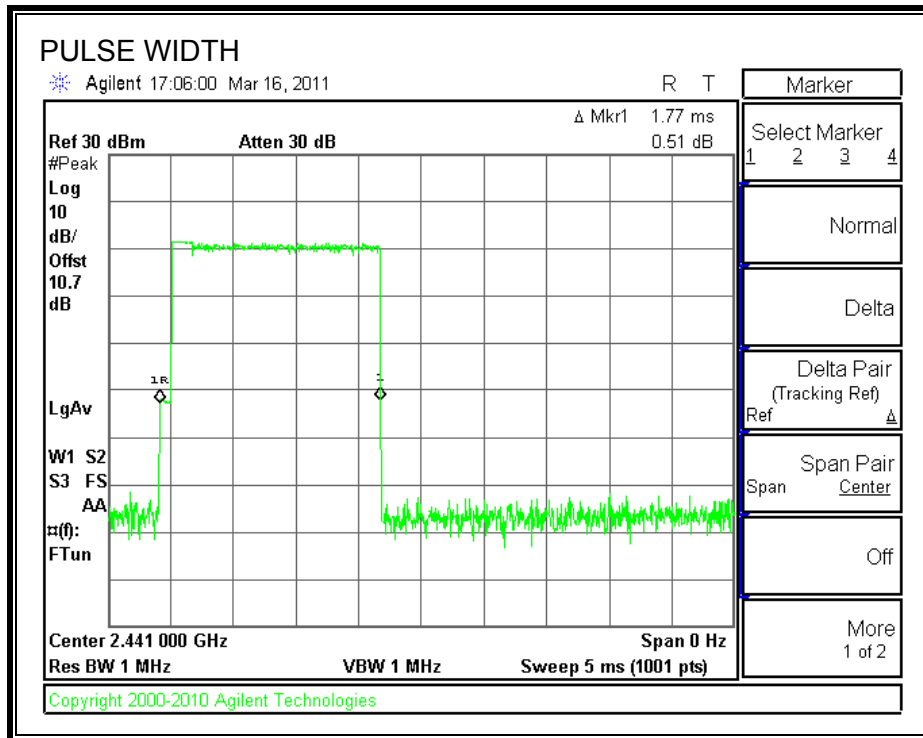


**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

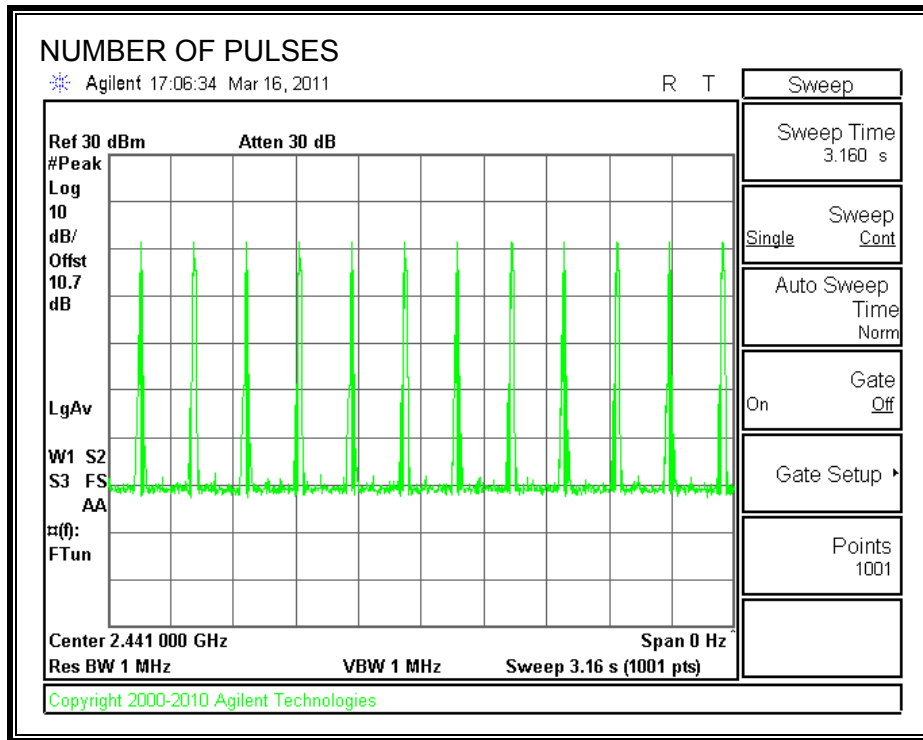


**DH3**

**PULSE WIDTH**

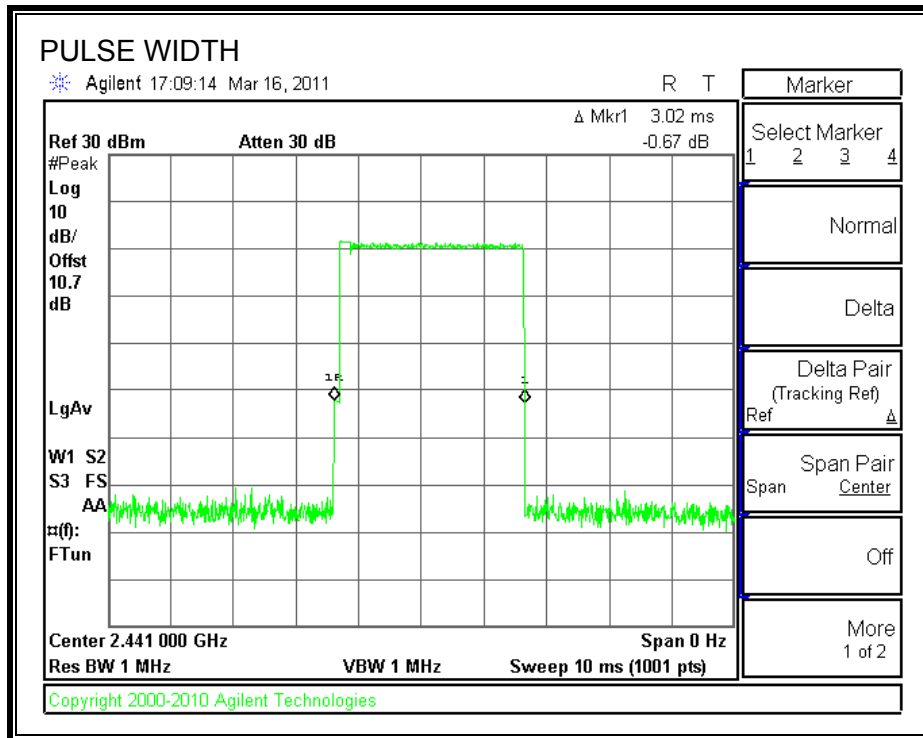


**NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD**

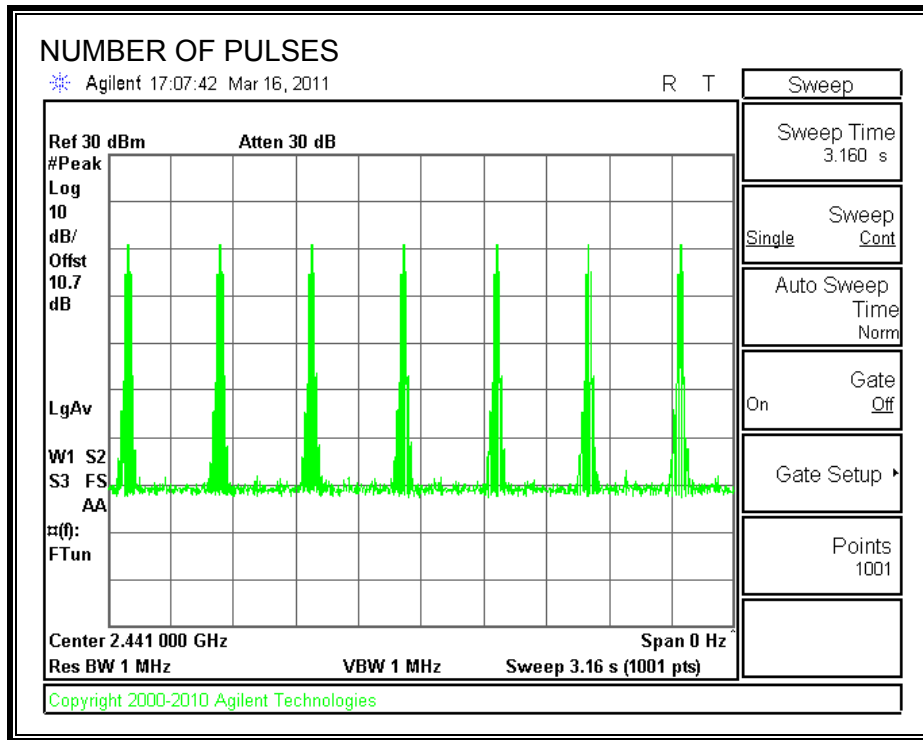


**DH5**

**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

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

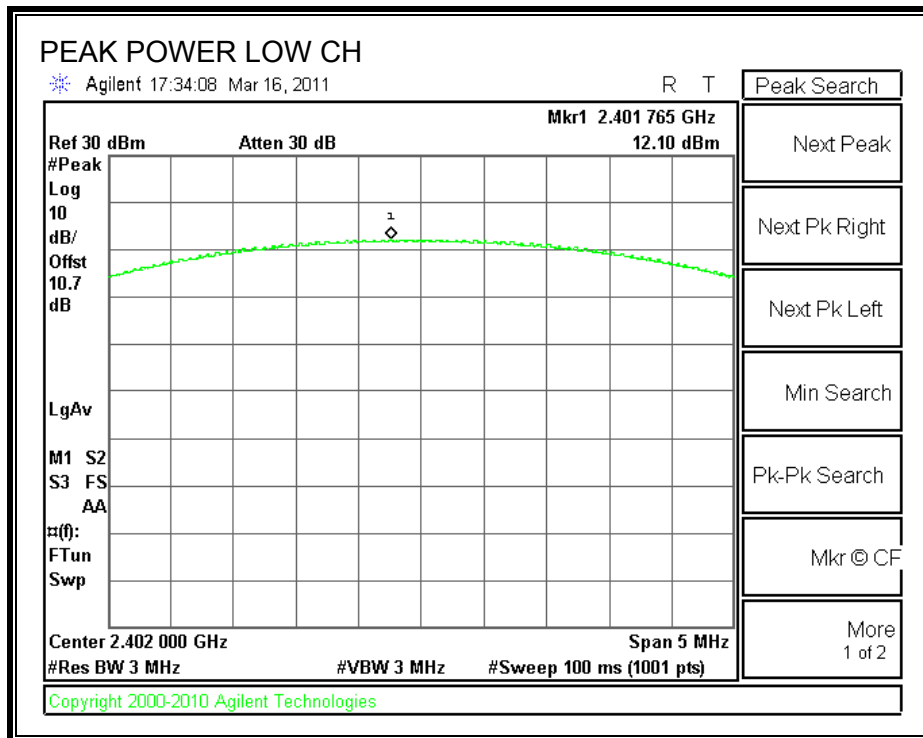
#### TEST PROCEDURE

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.

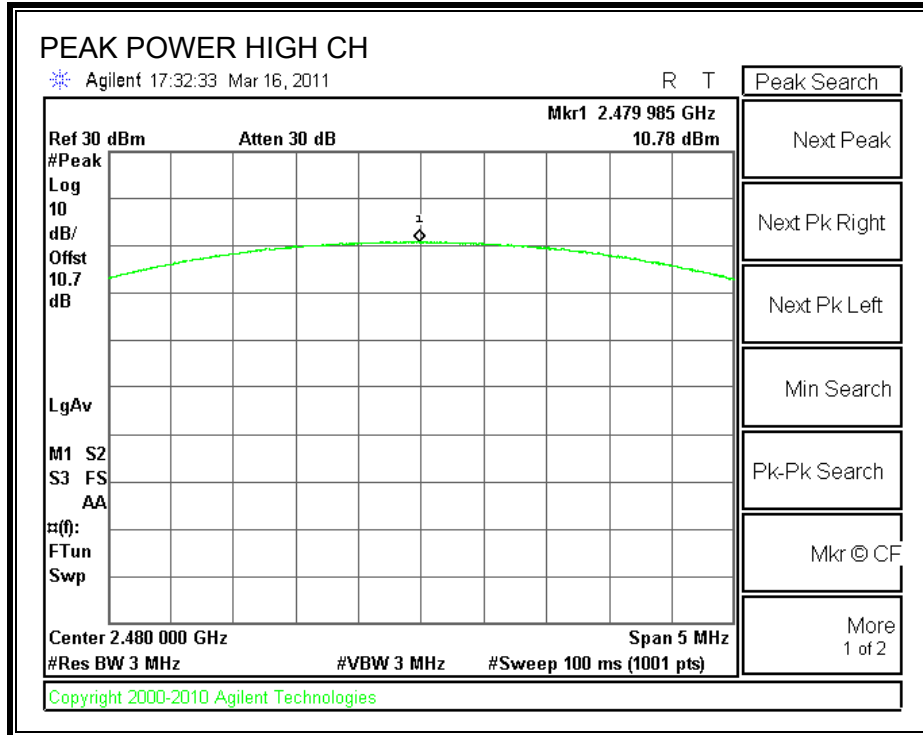
#### RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.10	30	-17.90
Middle	2441	11.92	30	-18.08
High	2480	10.78	30	-19.22

**OUTPUT POWER**







### 7.2.6. AVERAGE POWER

#### LIMIT

None; for reporting purposes only.

#### TEST PROCEDURE

The transmitter output is connected to a power meter.

#### RESULTS

The cable assembly insertion loss of 10.78 dB (including 10 dB pad and 0.74 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	6.59
Middle	2441	6.29
High	2480	5.43

## 7.2.7. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

### TEST PROCEDURE

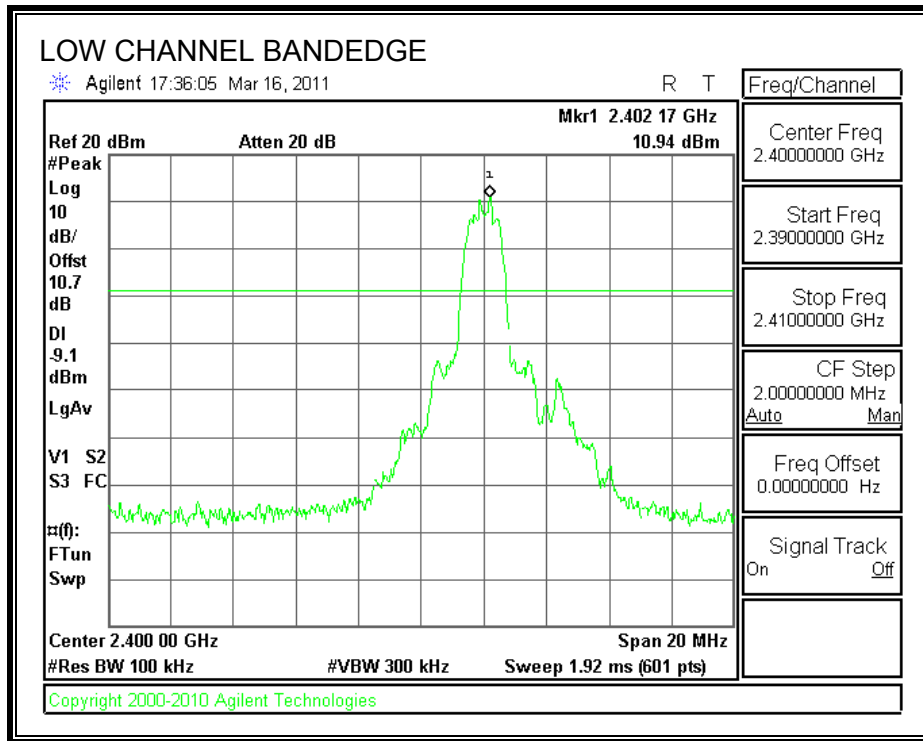
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

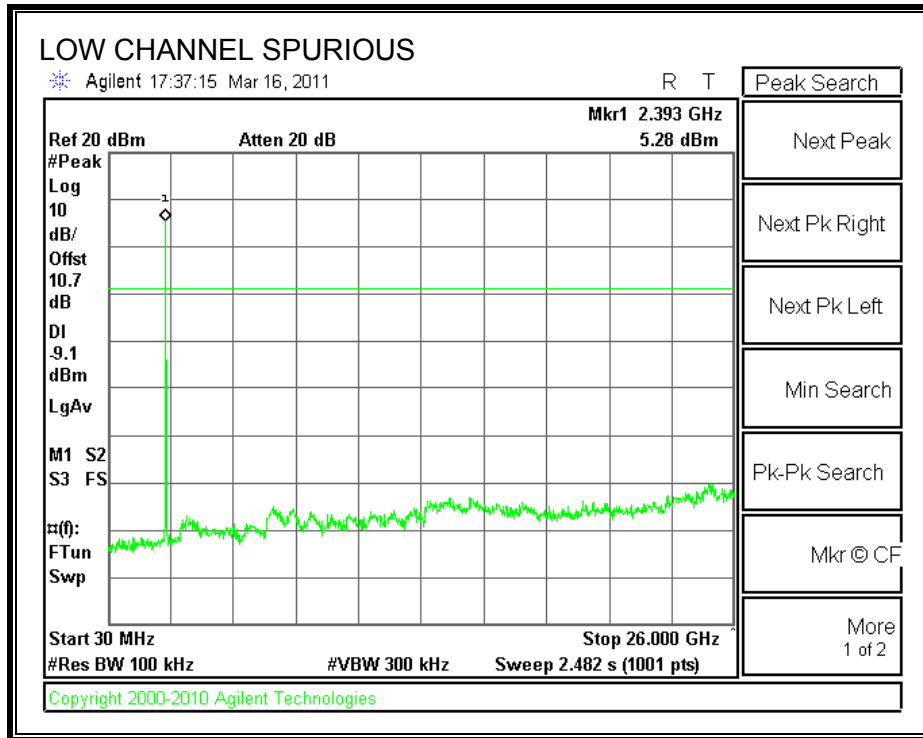
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

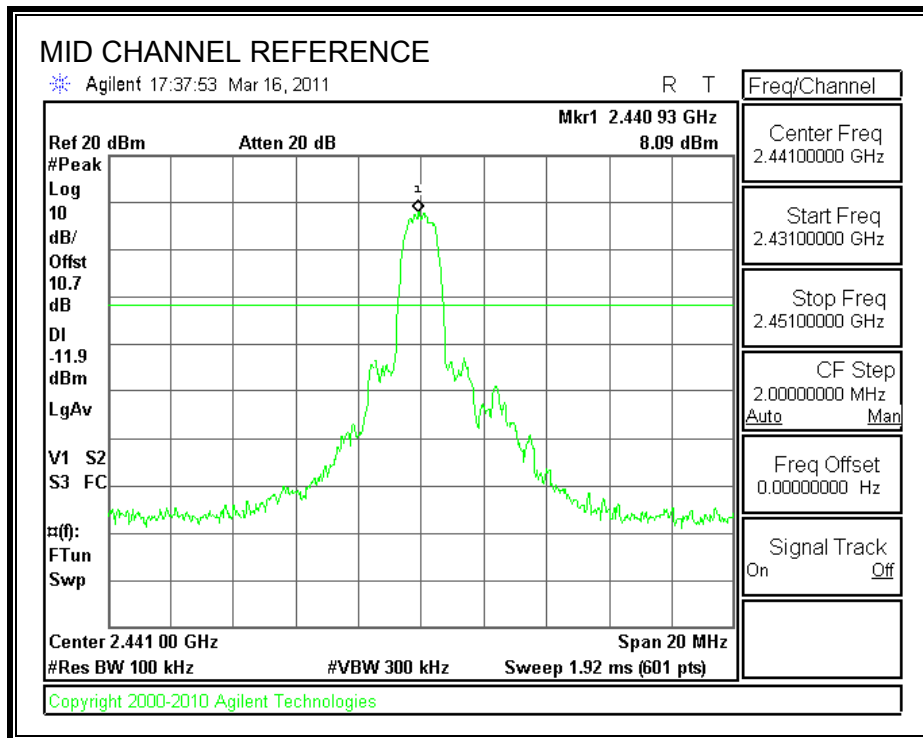
**RESULTS**

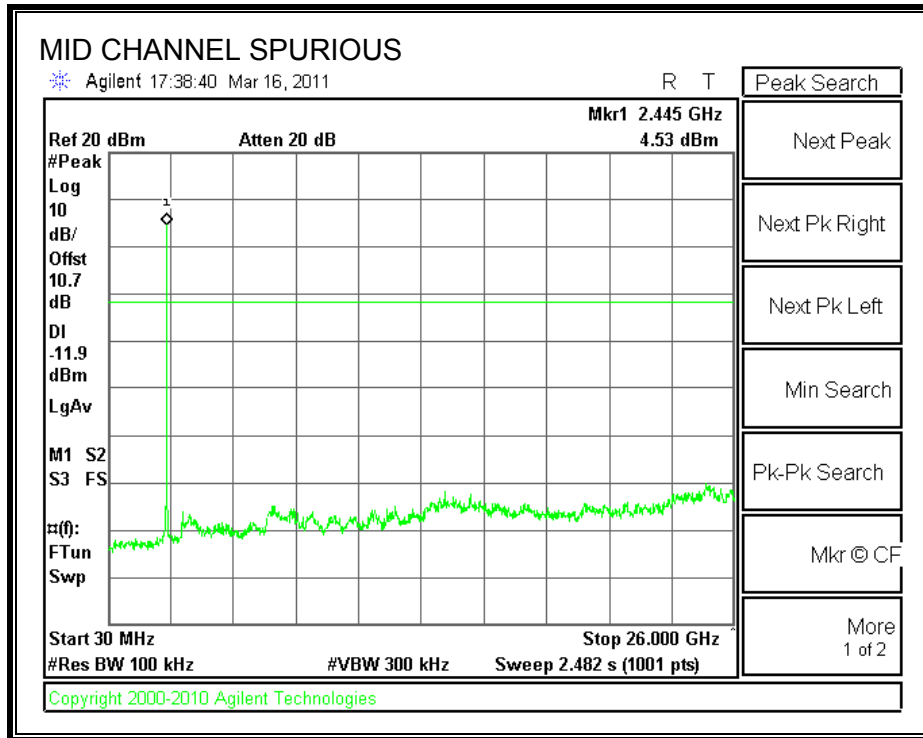
**SPURIOUS EMISSIONS, LOW CHANNEL**



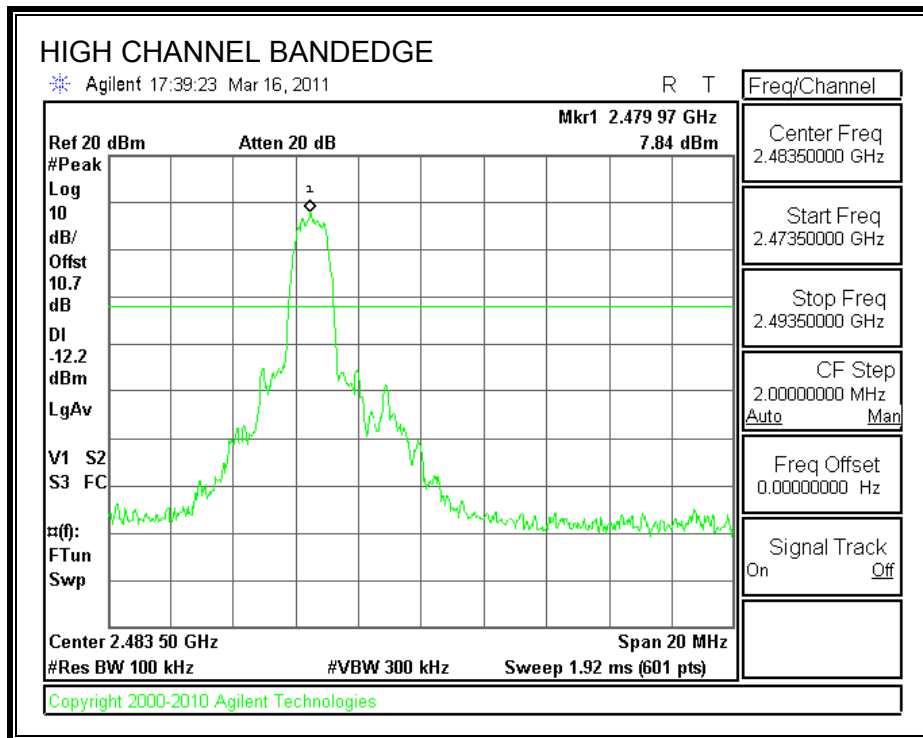


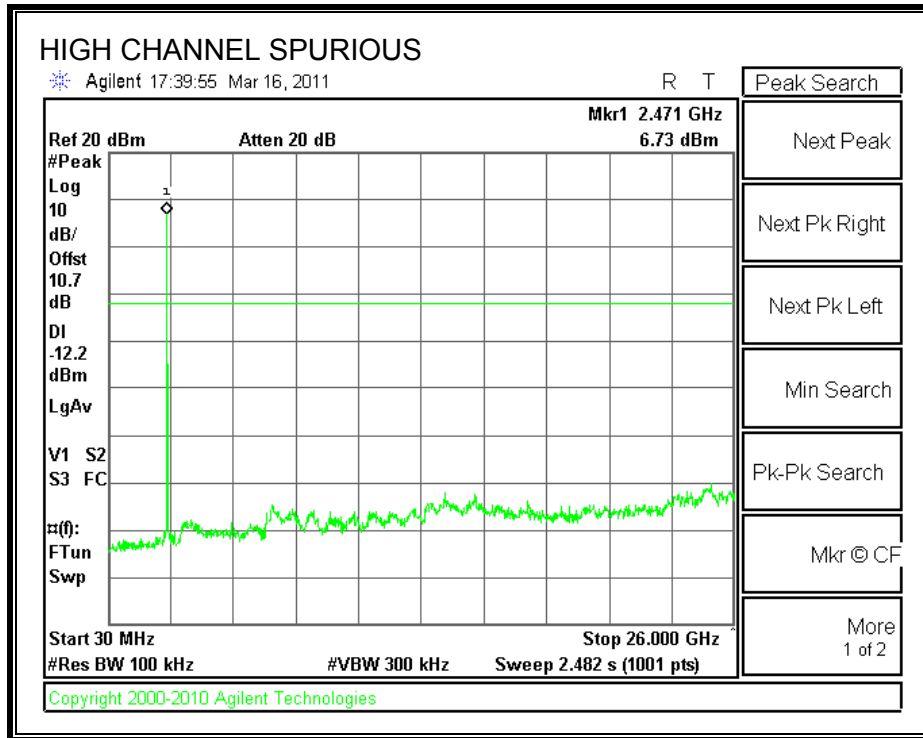
**SPURIOUS EMISSIONS, MID CHANNEL**



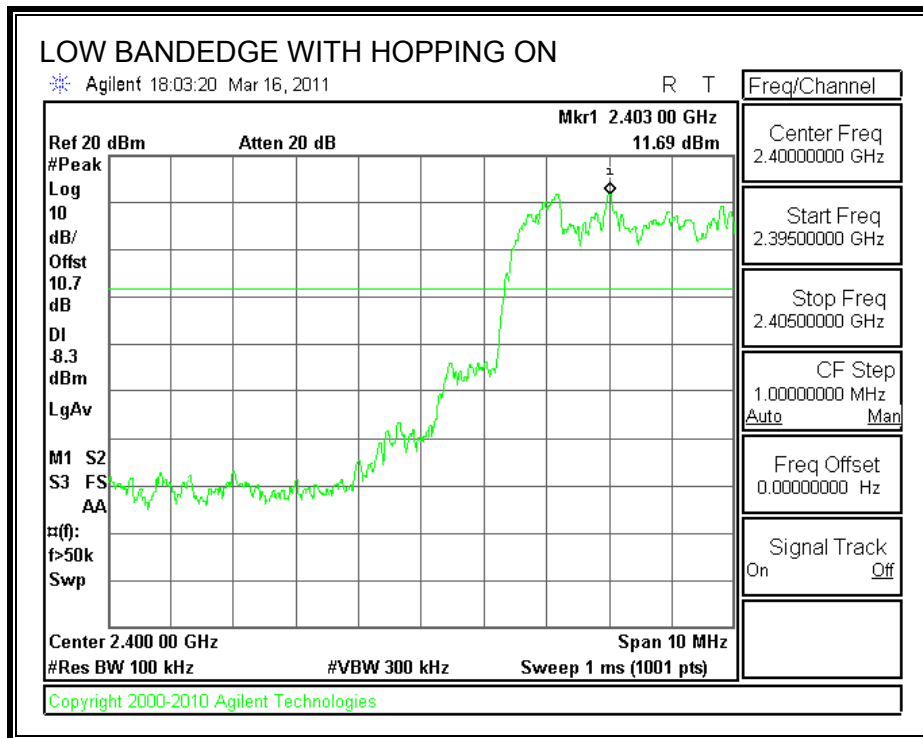


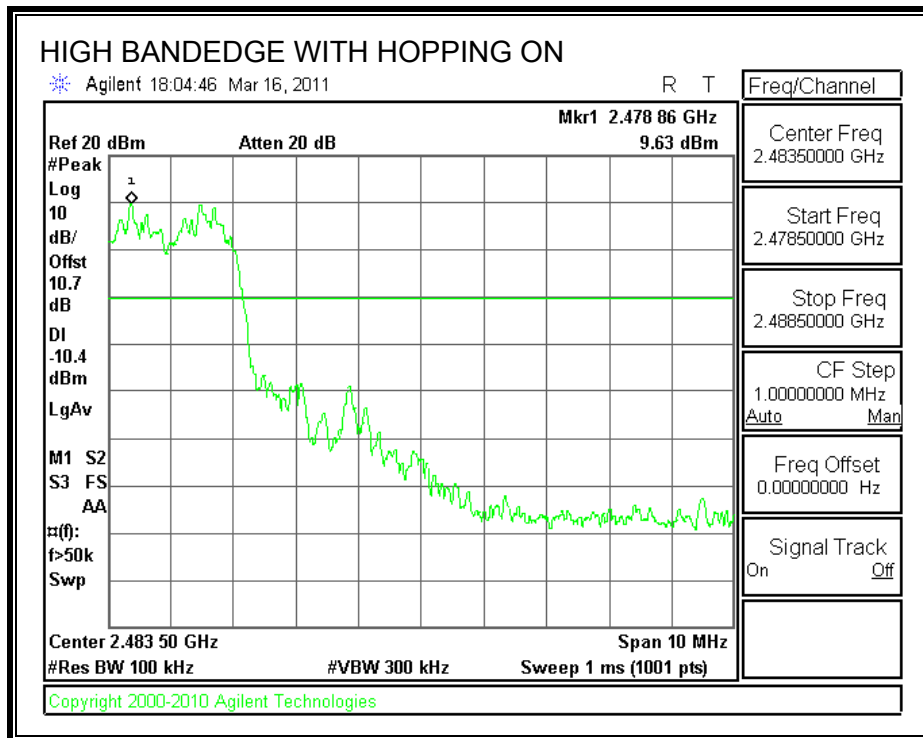
**SPURIOUS EMISSIONS, HIGH CHANNEL**





**SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON**





## 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.

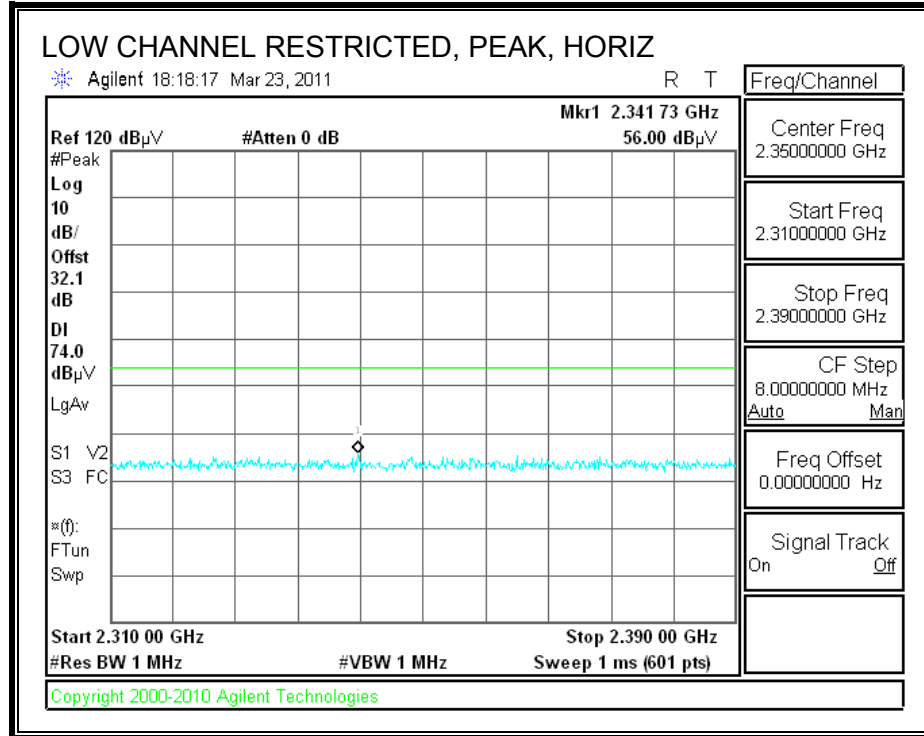
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

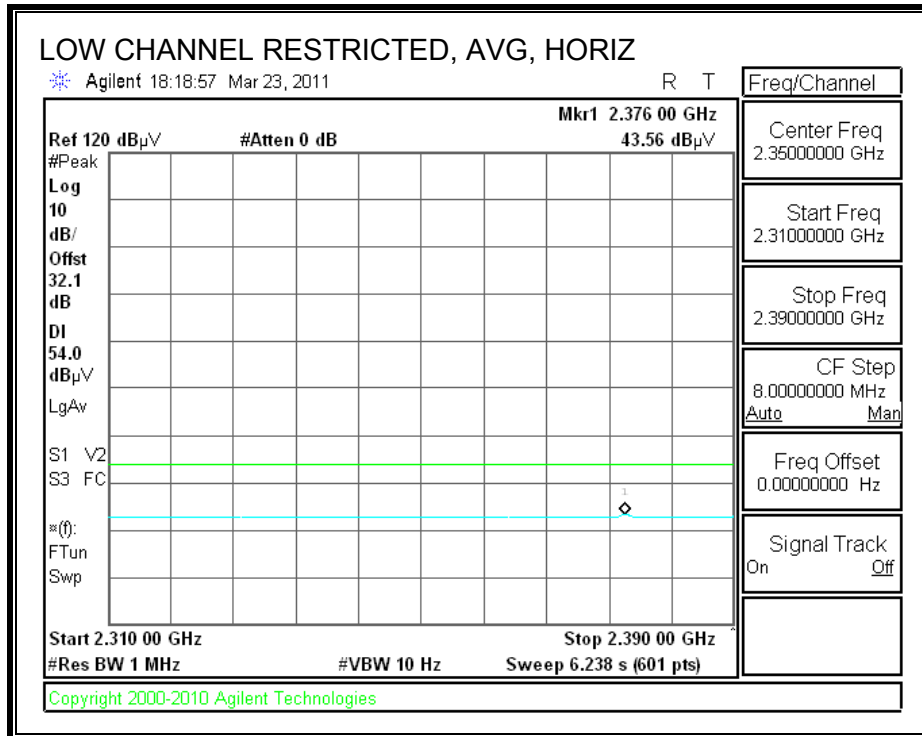
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz

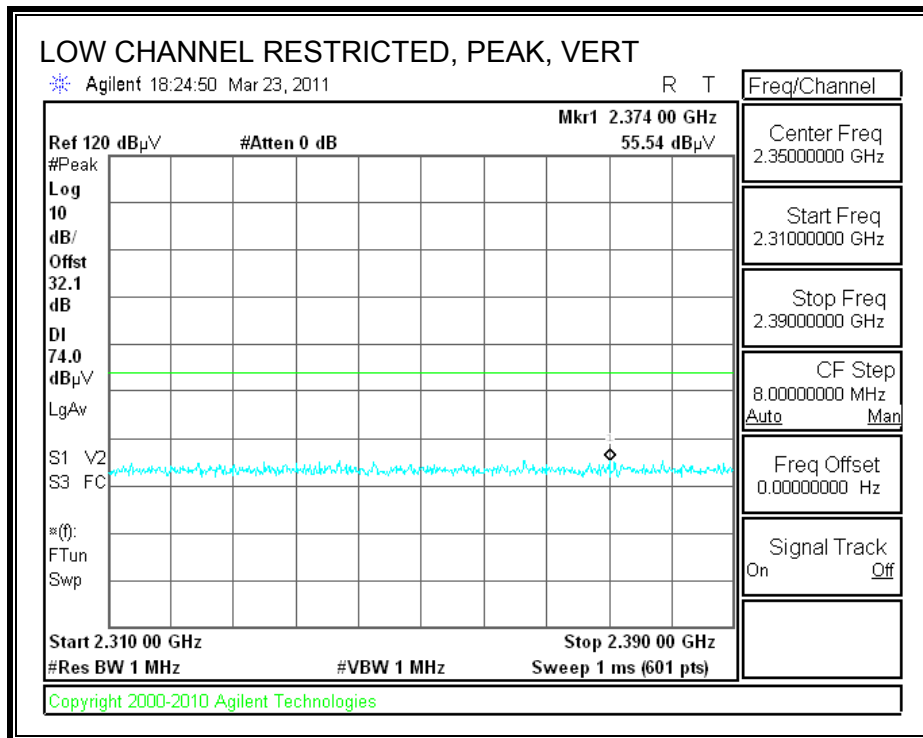
### 8.2.1. BASIC DATA RATE GFSK MODULATION

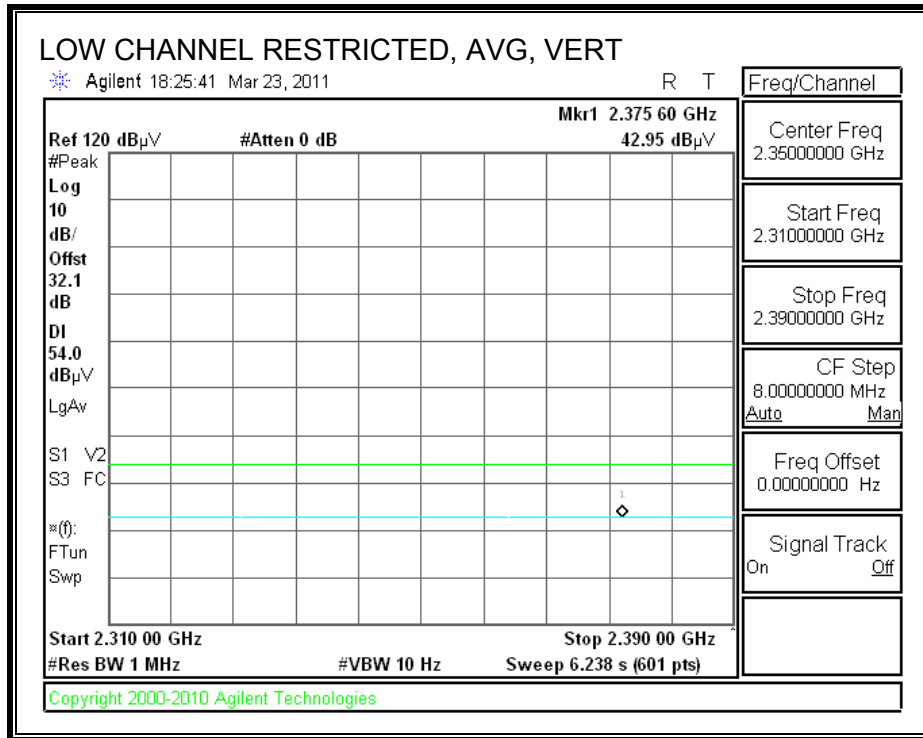
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



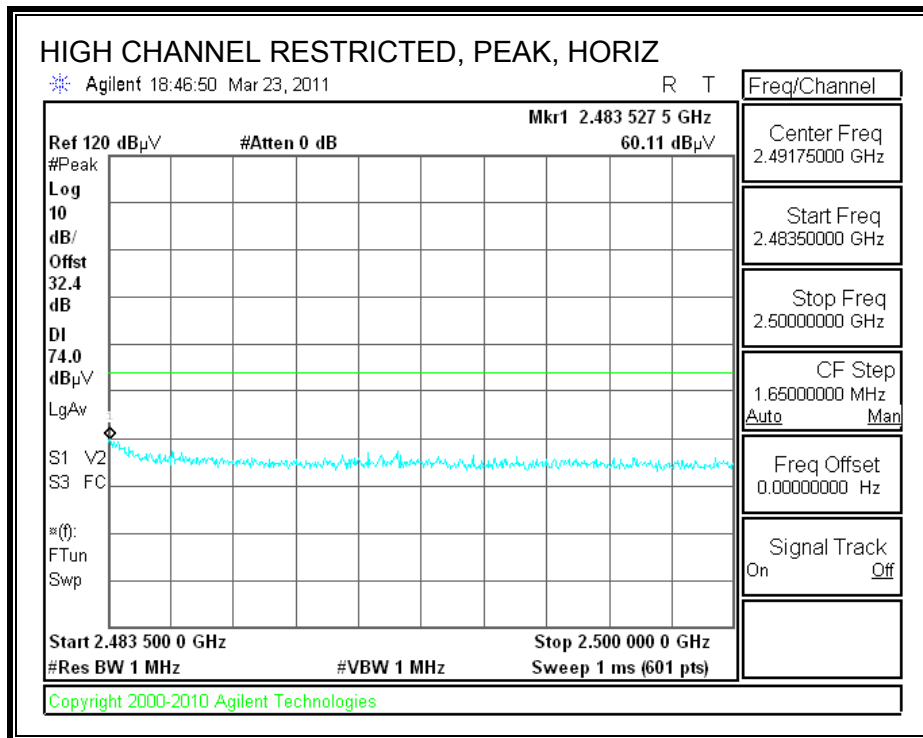


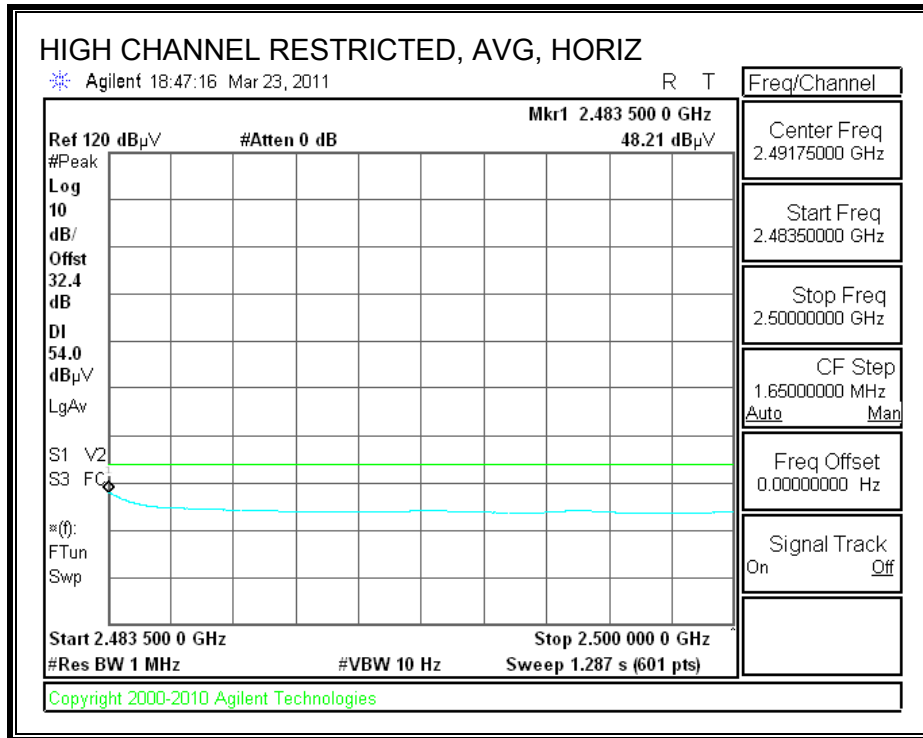
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



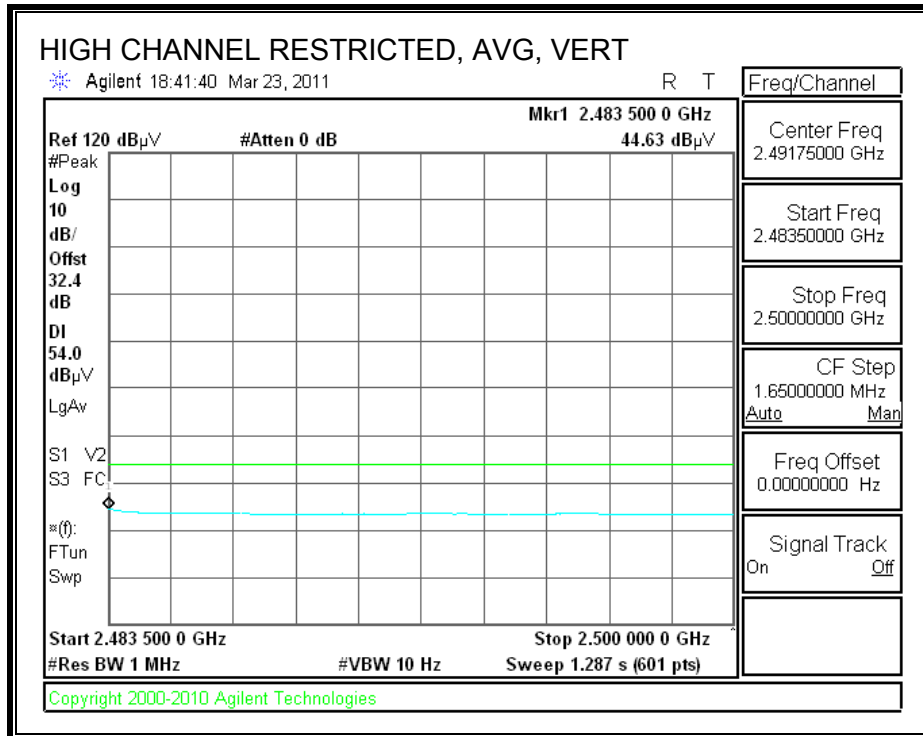


**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**









**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: Panasonic  
 Project #: 11J3719  
 Date: 23.03.2011  
 Test Engineer: Thanh Nguyen  
 Configuration: EUT, support Laptop  
 Mode: Transmit GFSK

**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 15.209

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

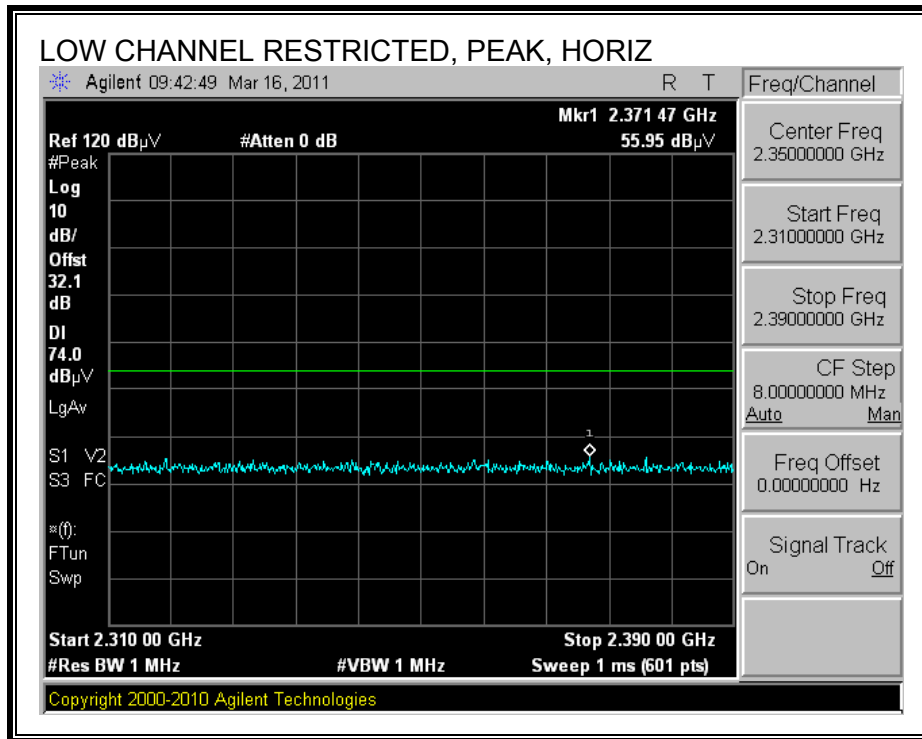
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Ftr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>Harmonics Spurious</b>															
<b>Low Ch 2402MHz</b>															
4.804	3.0	39.3	26.7	32.7	5.8	-34.8	0.0	0.0	42.9	30.3	74	54	-31.1	-23.7	V
7.206	3.0	38.3	25.5	35.4	7.2	-34.2	0.0	0.0	46.8	33.9	74	54	-27.2	-20.1	Noise floor
4.804	3.0	40.4	24.3	32.7	5.8	-34.8	0.0	0.0	44.0	27.9	74	54	-30.0	-26.1	H
7.206	3.0	37.6	24.6	35.4	7.2	-34.2	0.0	0.0	46.0	33.0	74	54	-28.0	-21.0	Noise floor
<b>Mid Ch 2441MHz</b>															
4.882	3.0	39.9	25.4	32.7	5.8	-34.8	0.0	0.0	43.7	29.2	74	54	-30.3	-24.8	V
7.323	3.0	38.3	25.4	35.5	7.3	-34.1	0.0	0.0	46.9	34.0	74	54	-27.1	-20.0	Noise floor
4.882	3.0	40.3	26.5	32.7	5.8	-34.8	0.0	0.0	44.1	30.2	74	54	-29.9	-23.8	V
7.323	3.0	38.6	25.8	35.5	7.3	-34.1	0.0	0.0	47.3	34.5	74	54	-26.7	-19.5	Noise floor
<b>High Ch 2480MHz</b>															
4.960	3.0	37.6	25.8	32.8	5.9	-34.8	0.0	0.0	41.5	29.7	74	54	-32.5	-24.3	V
7.440	3.0	36.8	23.0	35.6	7.3	-34.1	0.0	0.0	45.6	31.9	74	54	-28.4	-22.1	Noise floor
4.960	3.0	40.6	25.7	32.8	5.9	-34.8	0.0	0.0	44.5	29.6	74	54	-29.5	-24.4	H
7.440	3.0	37.6	24.6	35.6	7.3	-34.1	0.0	0.0	46.5	33.5	74	54	-27.5	-20.5	Noise floor
<b>Spurious Emissions</b>															
1.330	3.0	58.7	35.8	25.6	2.7	-37.8	0.0	0.0	49.2	26.3	74	54	-24.8	-27.7	V
1.990	3.0	57.2	33.1	27.8	3.4	-36.9	0.0	0.0	51.5	27.5	74	54	-22.5	-26.5	V
2.765	3.0	44.8	33.6	29.0	4.1	-36.1	0.0	0.0	41.9	30.7	74	54	-32.1	-23.3	V
3.205	3.0	44.4	36.2	30.2	4.5	-35.7	0.0	0.0	43.3	35.1	74	54	-30.7	-18.9	V
1.329	3.0	57.9	35.7	25.6	2.7	-37.8	0.0	0.0	48.4	26.2	74	54	-25.6	-27.8	H

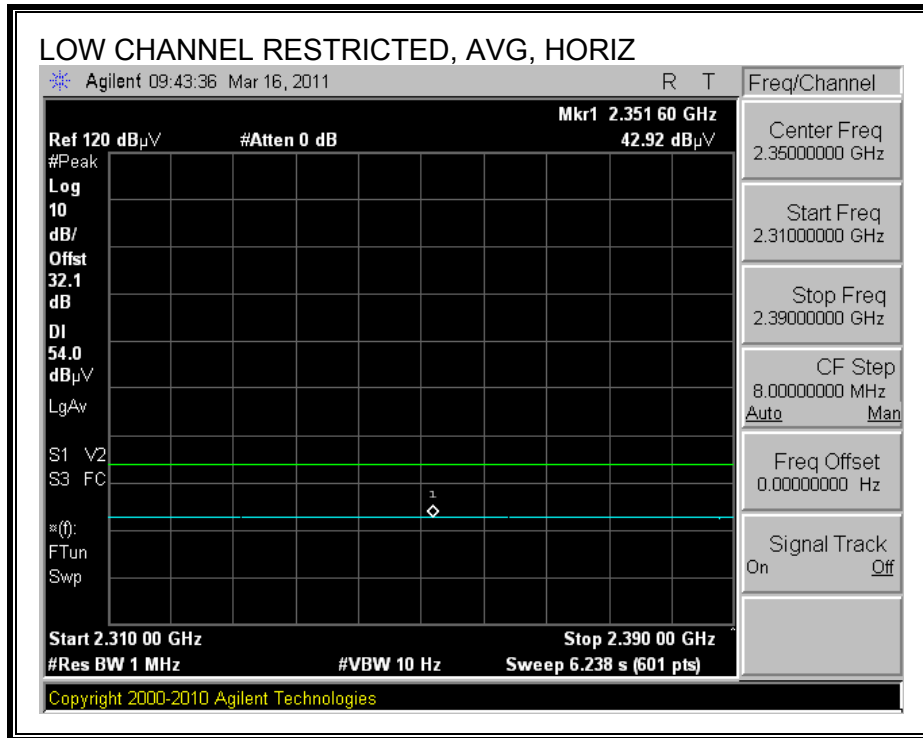
Rev. 07.22.09

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		

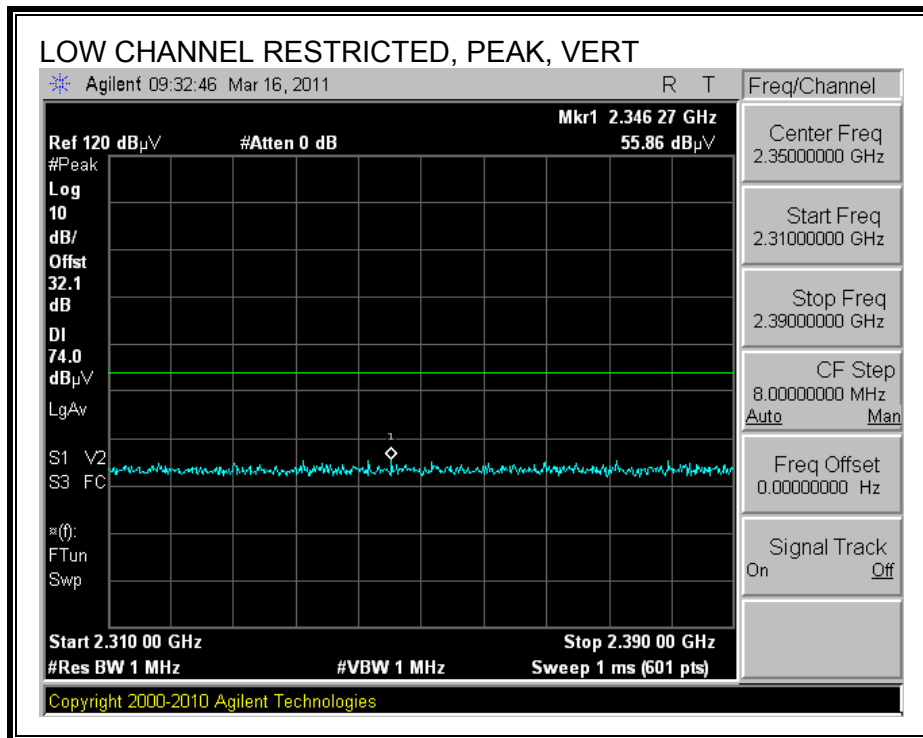
### 8.2.2. ENHANCED DATA RATE 8PSK MODULATION

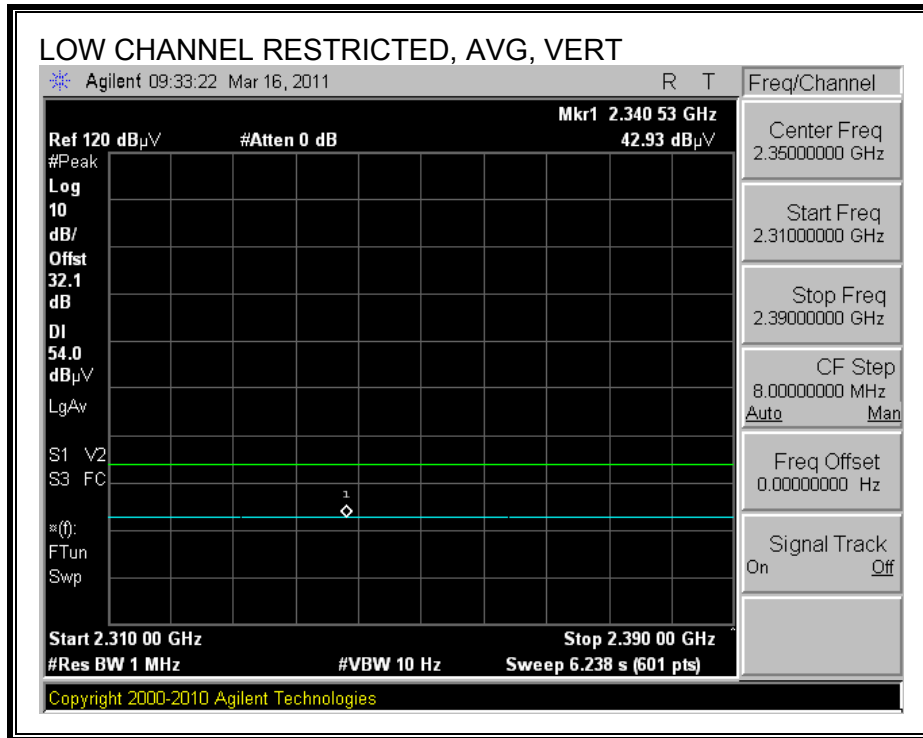
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



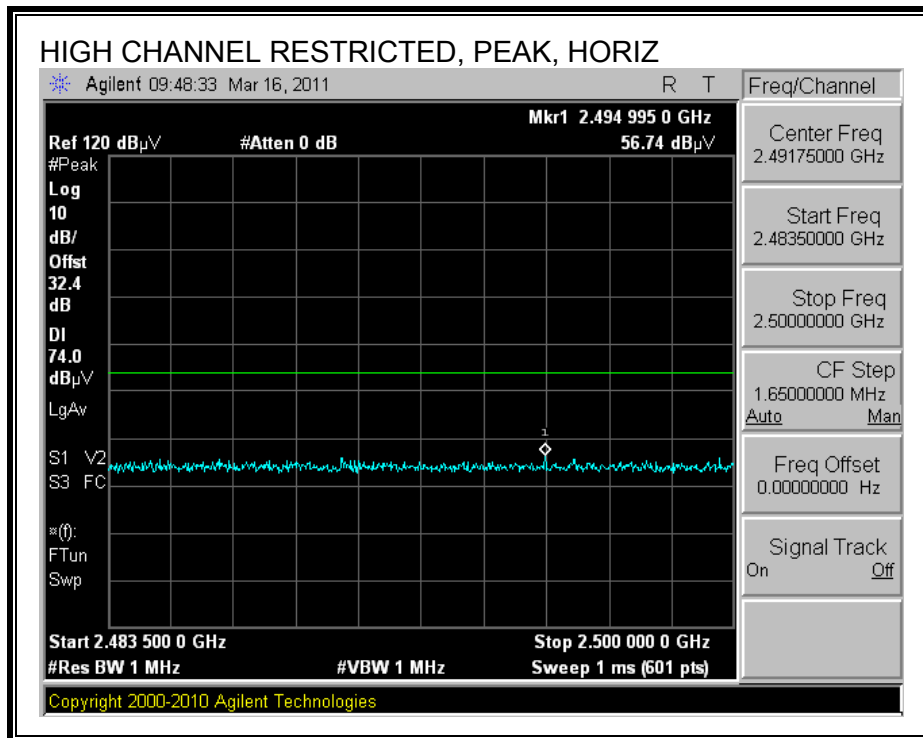


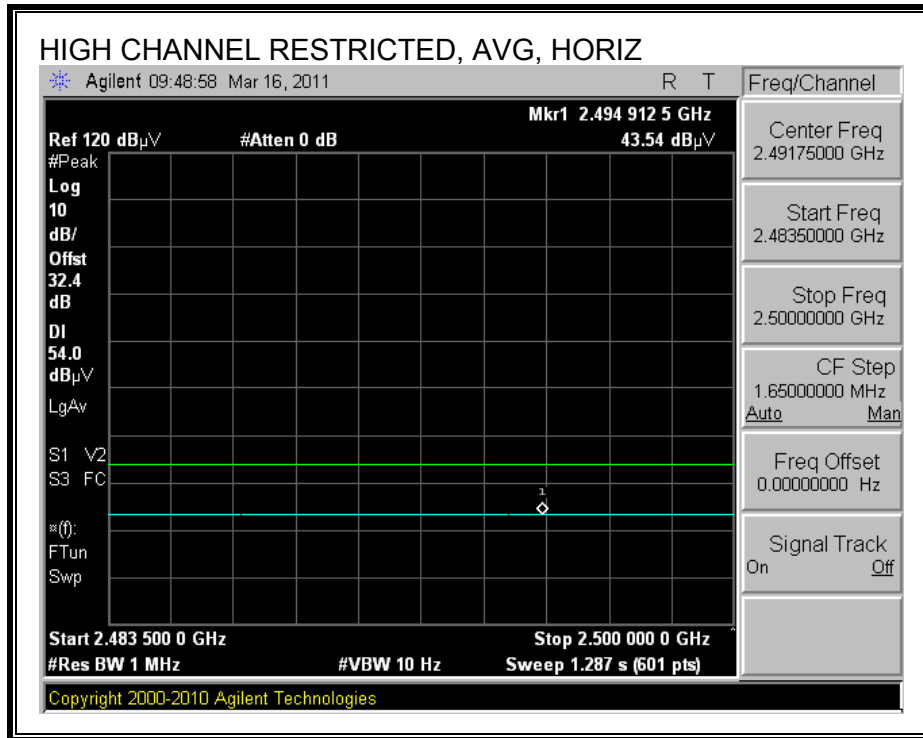
**RESTRICTED BANEDGE (LOW CHANNEL, VERTICAL)**



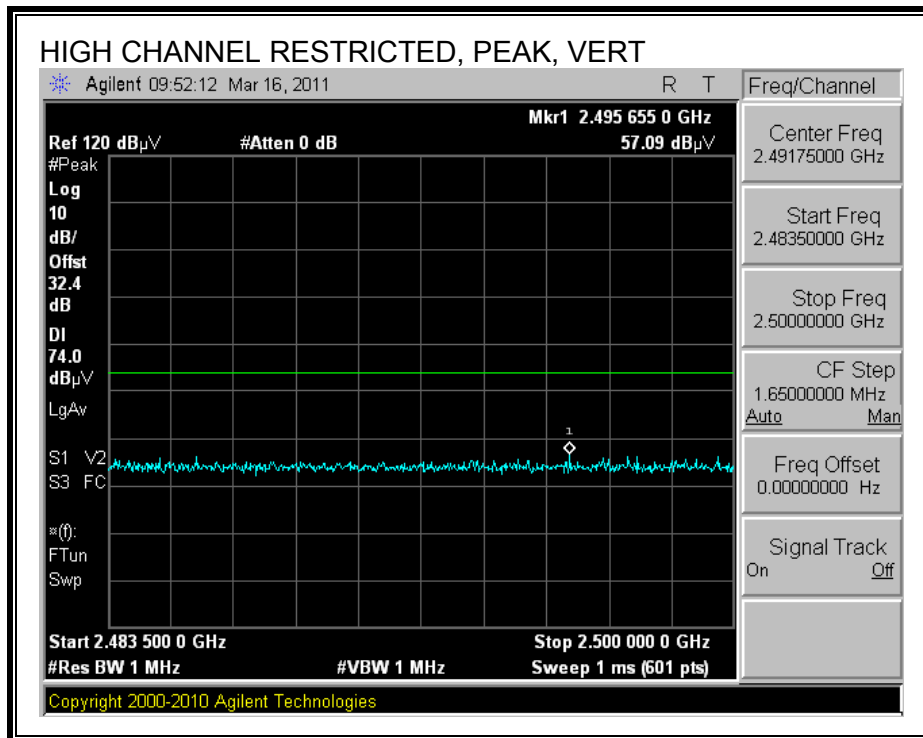


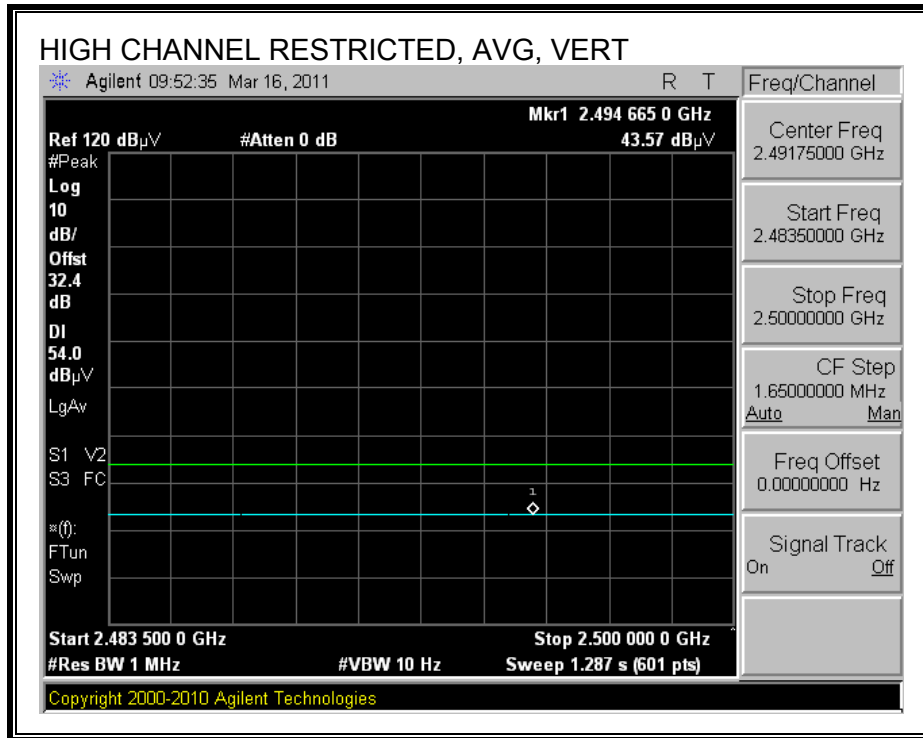
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





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





**HARMONICS AND SPURIOUS EMISSIONS**

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: Panasonic  
 Project #: 11J3719  
 Date: 26.03.2011  
 Test Engineer: Thanh Nguyen  
 Configuration: EUT, support Laptop  
 Mode: Transmit 8FSK

**Test Equipment:**

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931		T125; ARA 18-26GHz; S/N:1007	FCC 15.209

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	Dist	Read Pk	Read Avg.	AF	CL	Amp	D Corr	Ftr	Peak	Avg	Pk Lim	Avg Lim	Pk Mar	Avg Mar	Notes
GHz	(m)	dBuV	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB	dB	(V/H)
<b>Harmonics Spurious</b>															
<b>Low Ch 2402MHz</b>															
4.804	3.0	52.9	33.7	33.0	5.8	-36.5	0.0	0.0	55.2	36.0	74	54	-18.8	-18.0	V
7.206	3.0	48.1	31.2	35.1	7.2	-36.2	0.0	0.0	54.2	37.3	74	54	-19.8	-16.7	V
9.607	3.0	52.0	30.3	37.4	8.5	-36.9	0.0	0.0	61.0	39.3	74	54	-13.0	-14.7	V
12.010	3.0	40.0	24.2	39.0	9.7	-35.4	0.0	0.0	53.3	37.5	74	54	-20.7	-16.5	V
14.412	3.0	34.3	22.1	40.6	10.8	-35.3	0.0	0.0	50.4	38.2	74	54	-23.6	-15.8	Noise floor
4.804	3.0	52.5	33.4	33.0	5.8	-36.5	0.0	0.0	54.8	35.7	74	54	-19.2	-18.3	H
<b>Mid Ch 2441MHz</b>															
4.882	3.0	52.7	32.0	33.1	5.8	-36.5	0.0	0.0	55.1	34.4	74	54	-18.9	-19.6	V
7.323	3.0	52.4	33.1	35.3	7.3	-36.2	0.0	0.0	58.7	39.4	74	54	-15.3	-14.6	V
9.764	3.0	47.3	29.4	37.4	8.6	-37.0	0.0	0.0	56.3	38.4	74	54	-17.7	-15.6	V
12.205	3.0	36.4	23.1	39.0	9.8	-35.4	0.0	0.0	49.9	36.5	74	54	-24.1	-17.5	Noise floor
4.882	3.0	48.9	28.9	33.1	5.8	-36.5	0.0	0.0	51.4	31.4	74	54	-22.6	-22.6	H
<b>High Ch 2480MHz</b>															
4.960	3.0	52.8	27.4	33.2	5.9	-36.5	0.0	0.0	55.4	30.0	74	54	-18.6	-24.0	V
7.440	3.0	50.5	31.8	35.5	7.3	-36.2	0.0	0.0	57.1	38.4	74	54	-16.9	-15.6	V
9.920	3.0	49.6	30.6	37.5	8.7	-37.1	0.0	0.0	58.7	39.7	74	54	-15.3	-14.3	V
12.400	3.0	44.3	27.1	39.0	9.9	-35.4	0.0	0.0	57.8	40.6	74	54	-16.2	-13.4	V
14.880	3.0	35.6	22.9	40.3	11.0	-35.3	0.0	0.0	51.6	38.9	74	54	-22.4	-15.1	V
4.960	3.0	47.5	27.6	33.2	5.9	-36.5	0.0	0.0	50.2	30.2	74	54	-23.8	-23.8	H
<b>Spurious Emissions</b>															
1.333	3.0	52.9	35.8	25.0	2.8	-39.0	0.0	0.0	41.6	24.5	74	54	-32.4	-29.5	V
1.992	3.0	55.7	33.1	27.2	3.5	-38.1	0.0	0.0	48.2	25.7	74	54	-25.8	-28.3	V
2.483	3.0	53.4	33.6	28.5	3.9	-37.5	0.0	0.0	48.3	28.5	74	54	-25.7	-25.5	V
3.205	3.0	44.4	36.2	30.5	4.5	-37.2	0.0	0.0	42.2	33.9	74	54	-31.8	-20.1	V
1.492	3.0	46.9	31.1	25.5	2.9	-38.8	0.0	0.0	36.6	20.8	74	54	-37.4	-33.2	H

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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. RECEIVER ABOVE 1 GHz

**High Frequency Measurement**  
 Compliance Certification Services, Fremont 5m Chamber

Company: BroadCom  
 Project #: 11J13719  
 Date: 3/29/2011  
 Test Engineer: Thanh Nguyen  
 Configuration: EUT outside the support laptop  
 Mode: Receive

**Test Equipment:**

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			RX RSS 210

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			Average Measurements RBW=1MHz ; VBW=10Hz

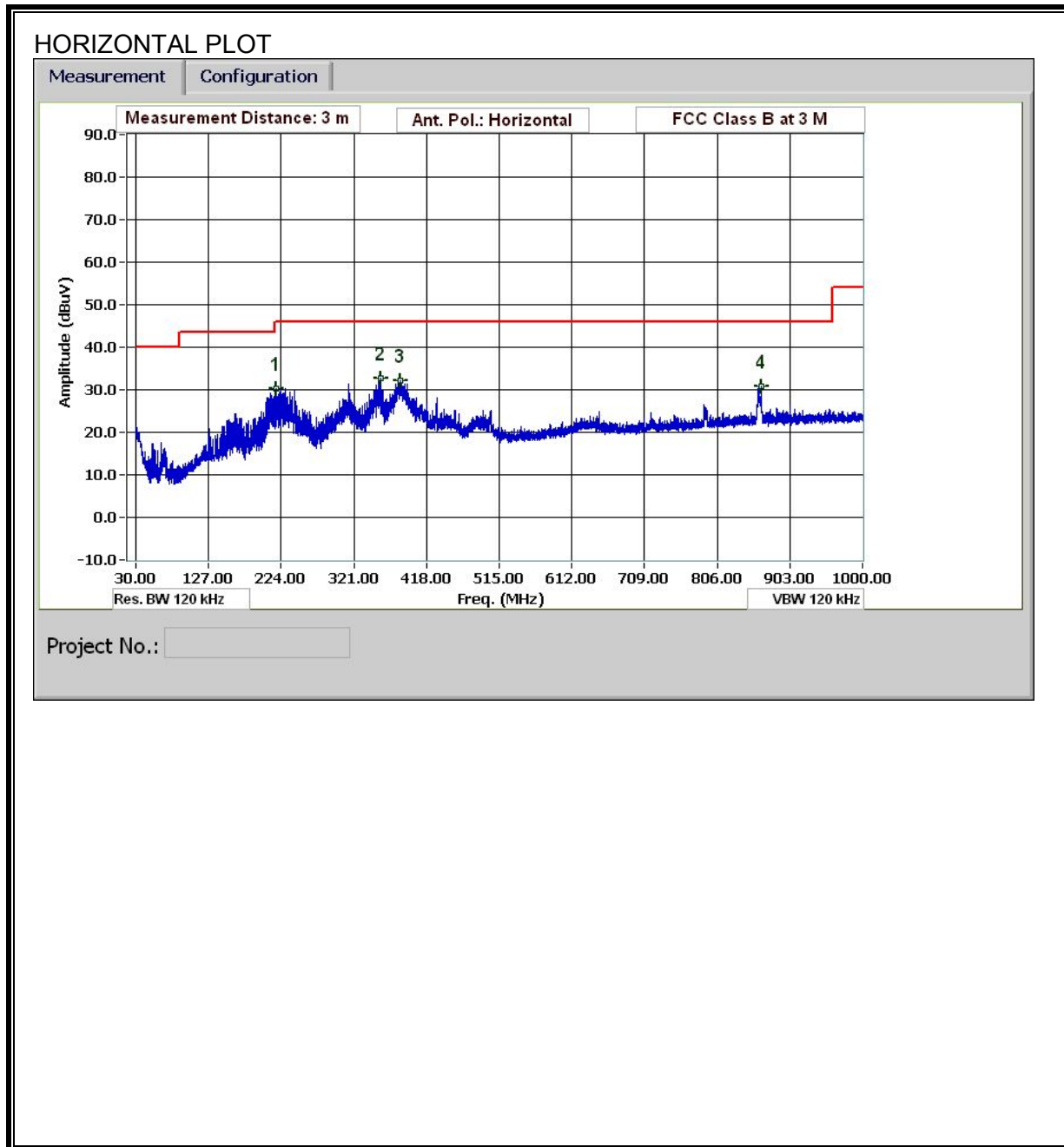
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
2.000	3.0	45.3	30.6	27.8	3.5	-36.9	0.0	0.0	39.7	24.9	74	54	-34.3	-29.1	V
2.660	3.0	44.6	29.0	28.7	4.1	-36.1	0.0	0.0	41.3	25.6	74	54	-32.7	-28.4	V
1.213	3.0	47.6	31.3	25.2	2.6	-38.0	0.0	0.0	37.4	21.1	74	54	-36.6	-32.9	H
No other emissions were detected above the system noise floor.															

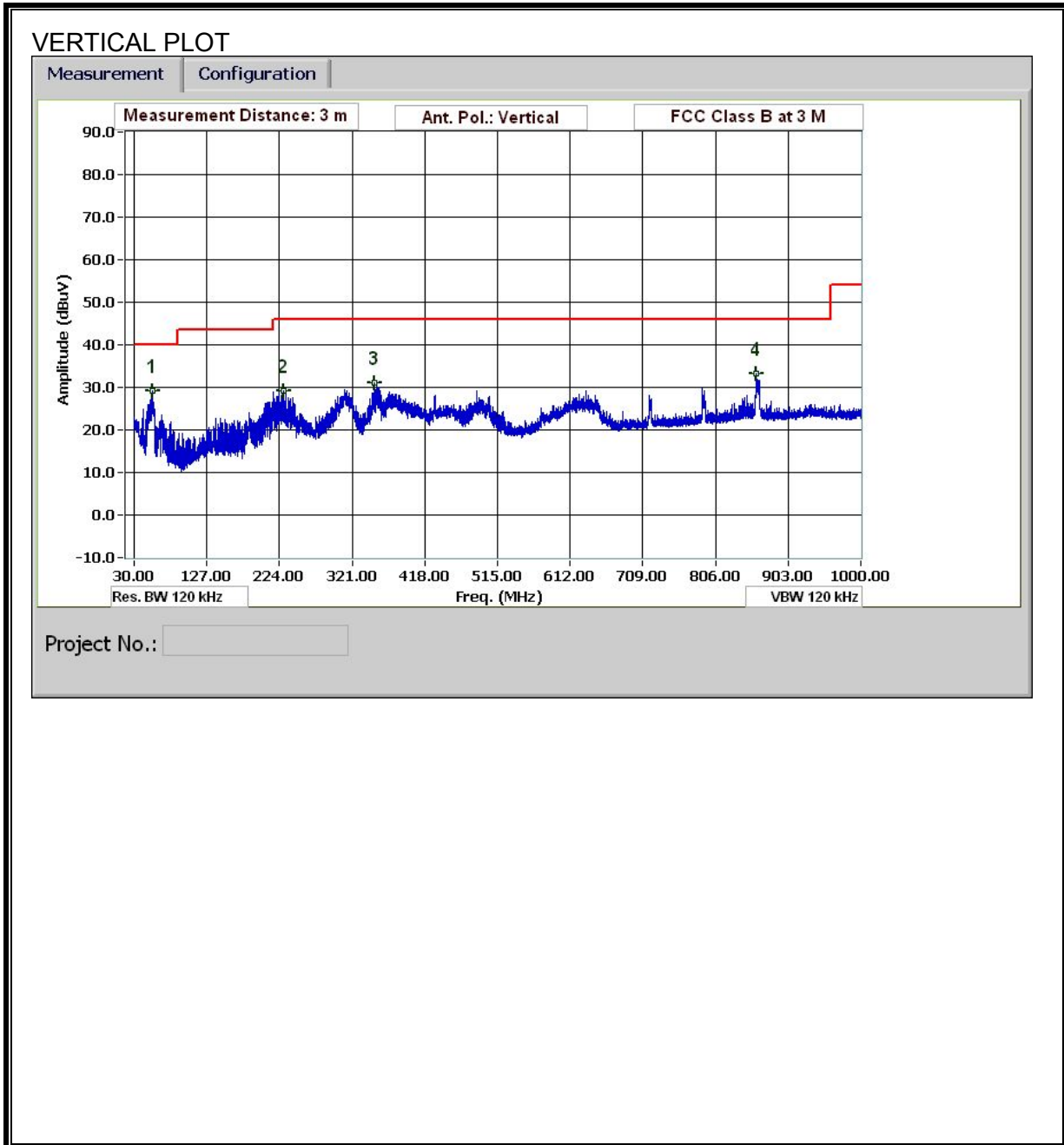
Rev. 07.22.09

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		

### 8.4. WORST-CASE BELOW 1 GHz

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





**HORIZONTAL AND VERTICAL DATA**

Compliance Certification Services, Fremont 5m Chamber													
Test Engr:		David Garcia											
Date:		03/16/11											
Project #:		11J13719											
Company:		Panasonic											
Test Target:		FCC Part 15 Class B											
Mode Oper:		Tx, Worst Case											
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit								
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters										
Read	Analyzer Reading	Filter	Filter Insert Loss										
AF	Antenna Factor	Corr.	Calculated Field Strength										
CL	Cable Loss	Limit	Field Strength Limit										
f	Dist	Read	AF	CL	Amp	D Corr	Pad	Corr.	Limit	Margin	Ant. Pol.	Det.	Notes
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	
217.808	3.0	45.2	11.9	1.3	28.2	0.0	0.0	30.2	46.0	-15.8	H	P	
356.893	3.0	44.9	14.3	1.7	28.1	0.0	0.0	32.7	46.0	-13.3	H	P	
382.815	3.0	43.9	14.7	1.8	28.1	0.0	0.0	32.2	46.0	-13.8	H	P	
864.514	3.0	34.1	21.5	2.7	27.7	0.0	0.0	30.7	46.0	-15.3	H	P	
54.241	3.0	48.7	8.2	0.7	28.4	0.0	0.0	29.2	40.0	-10.8	V	P	
229.448	3.0	44.3	11.9	1.3	28.2	0.0	0.0	29.2	46.0	-16.8	V	P	
350.893	3.0	43.3	14.2	1.7	28.1	0.0	0.0	31.0	46.0	-15.0	V	P	
860.074	3.0	36.7	21.5	2.7	27.6	0.0	0.0	33.3	46.0	-12.7	V	P	

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Note: No other emissions were detected above the system noise floor.

## 9. AC POWER LINE CONDUCTED EMISSIONS

### LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

### TEST PROCEDURE

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

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

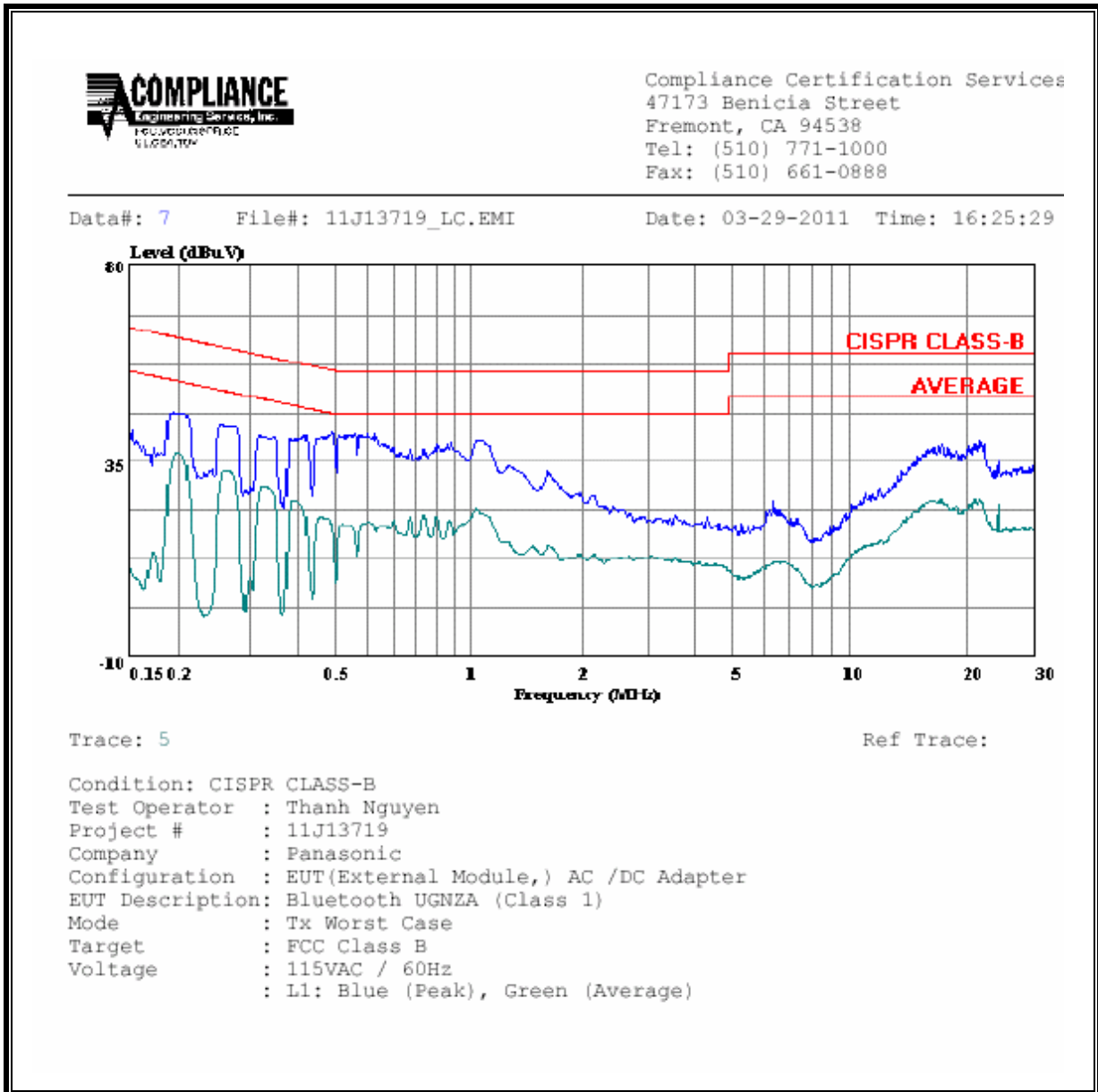
Line conducted data is recorded for both NEUTRAL and HOT lines.

**RESULTS**

**6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN B AV	Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.20	46.03	--	37.24	0.00	63.53	53.53	-17.50	-16.29	L1
0.56	41.34	--	21.19	0.00	56.00	46.00	-14.66	-24.81	L1
21.60	39.76	--	26.38	0.00	60.00	50.00	-20.24	-23.62	L1
0.45	33.10	--	17.75	0.00	56.89	46.89	-23.79	-29.14	L2
1.17	34.11	--	17.08	0.00	56.00	46.00	-21.89	-28.92	L2
20.92	39.24	--	24.92	0.00	60.00	50.00	-20.76	-25.08	L2
6 Worst Data									

**LINE 1 RESULTS**



Trace: 5

Ref Trace:

Condition: CISPR CLASS-B  
Test Operator : Thanh Nguyen  
Project # : 11J13719  
Company : Panasonic  
Configuration : EUT(External Module,) AC /DC Adapter  
EUT Description: Bluetooth UGNZA (Class 1)  
Mode : Tx Worst Case  
Target : FCC Class B  
Voltage : 115VAC / 60Hz  
L1: Blue (Peak), Green (Average)



## 10. MAXIMUM PERMISSIBLE EXPOSURE

### FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

f = frequency in MHz

\* = Plane-wave equivalent power density

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

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

**IC RULES**

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

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

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m <sup>2</sup> )	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	280/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> <sup>0.5</sup>	0.0042 <i>f</i> <sup>0.5</sup>	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> <sup>1.2</sup>
150 000–300 000	0.158 <i>f</i> <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> <i>f</i>	616 000 / <i>f</i> <sup>1.2</sup>

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

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

## **EQUATIONS**

Power density is given by:

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

where

S = Power density in W/m<sup>2</sup>

EIRP = Equivalent Isotropic Radiated Power in W

D = Separation distance in m

Power density in units of W/m<sup>2</sup> is converted to units of mW/cm<sup>2</sup> by dividing by 10.

Distance is given by:

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

where

D = Separation distance in m

EIRP = Equivalent Isotropic Radiated Power in W

S = Power density in W/m<sup>2</sup>

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

## **LIMITS**

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

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

**RESULTS**

Single Chain and non-co-located transmitters								
Band	Mode	Separation Distance (m)	Output AV Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	IC Power Density (W/m <sup>2</sup> )	FCC Power Density (mW/cm <sup>2</sup> )
2.4 GHz	Bluetooth	0.20	10.93	3.69	14.62	0.03	0.06	0.006