



**FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7**

CERTIFICATION TEST REPORT

FOR

WIRELESS MICROPHONE CLIP

MODEL NUMBER: PA50

**FCC ID: AL8-PA50
IC: 457A-PA50**

REPORT NUMBER: 10U13313-1, Revision A

ISSUE DATE: AUGUST 9, 2010

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	07/27/10	Initial Issue	F. Ibrahim
A	08/09/10	Revised RBW and VBW in the Hopping Frequency Separation section.	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PLANTRONICS, INC.
345 ENCINAL STREET
SANTA CRUZ, CA, 95060, U.S.A

EUT DESCRIPTION: WIRELESS MICRO CLIP

MODEL: PA50

SERIAL NUMBER: R2

DATE TESTED: JULY 13-14, 2010

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

Compliance Certification Services, Inc. (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 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by 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 CCS By:



FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:



THANH NGUYEN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

3. FACILITIES AND ACCREDITATION

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

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 Wireless Microphone Clip.

The radio module is manufactured by Plamex SA DE CV, Avenida Production #216. Parque Industrial Internacional, Tijuana Mesa De Otay, Tijuana, Baja California 22425, Mexico.

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	7.11	5.14
2402 - 2480	Enhanced 8PSK	4.07	2.55

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a printed PIFA antenna, with a maximum gain of 1.5 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was BC5, rev. 6324

The EUT driver software installed in the host support equipment during testing was V00.39
2010.05.26 11:00

The test utility software used during testing was Bluetest.exe, exercise the Bluecore Build-in selftest. (BIST) function.

5.5. WORST-CASE CONFIGURATION AND MODE

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

Radiated emissions 30-1000 MHz was performed with the EUT set to transmit at the channel with highest output power.

Three orthogonal orientation were investigated and it was determined that Y orientation is the worst-case orientation; therefore, all radiated testing was performed in the Y orientation.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Not Applicable; EUT is a stand-alone unit.

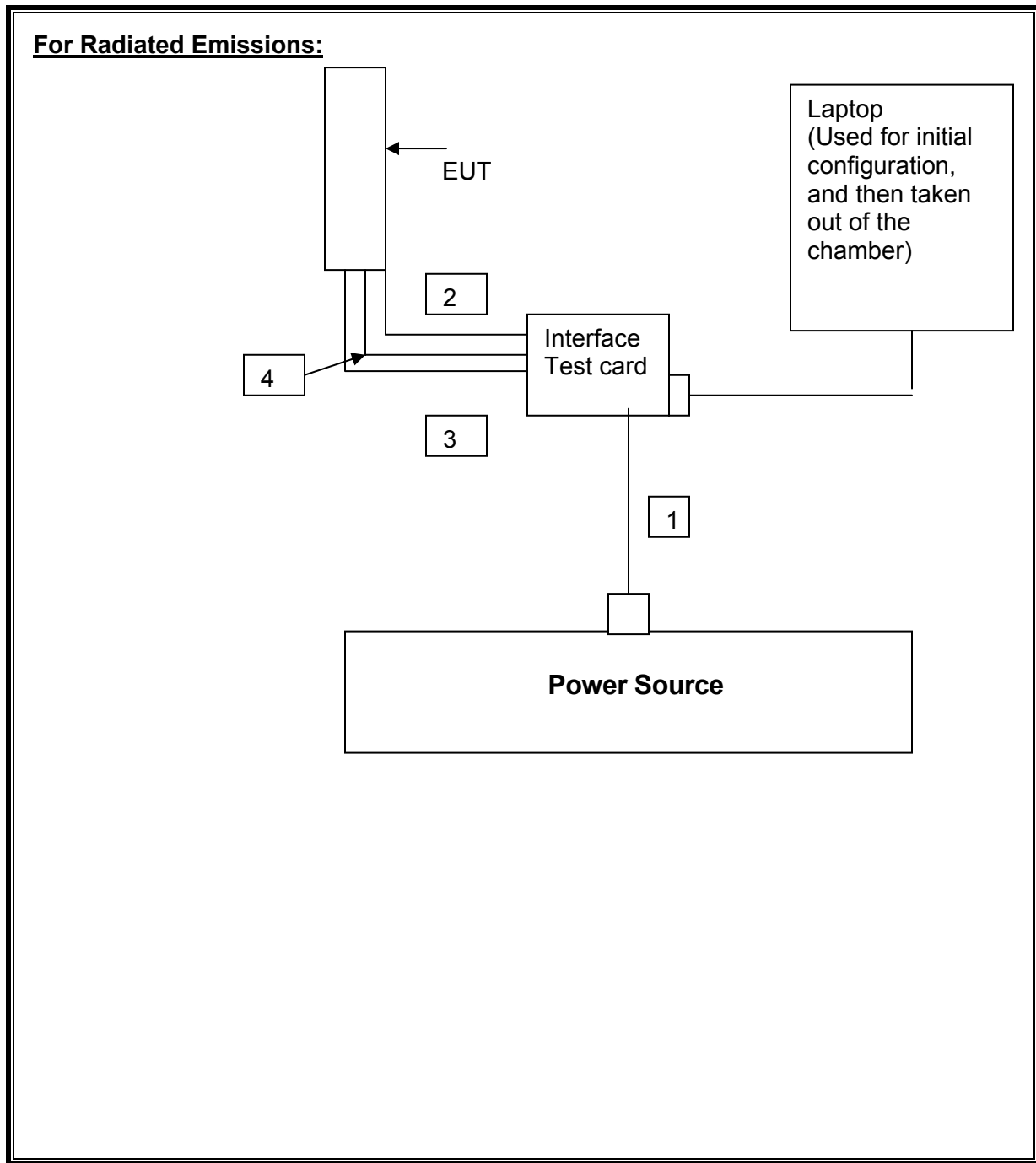
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	N/A
2	Tx	1	Flat Terminator	Un-shielded	2m	N/A
3	Rx	1	Flat Terminator	Un-shielded	2m	N/A
4	GND	1	N/A	Un-shielded	2m	Soldered to PCB

TEST SETUP

The EUT is connected to an interface test card and a laptop computer used to exercise the radio card then remove out of the chamber.

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	01/14/09	12/18/10
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	03/31/09	12/19/10
PSA Series Spectrum Analyzer	Agilent / HP	E4446A	C01069	01/05/10	04/05/11
Power Meter	Boonton	4541 RF	C01189	02/26/10	02/26/11
Power sensor	Boonton	57006	6871	02/27/10	02/27/11
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/22/09	12/18/10
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/05/09	12/17/10

7. ANTENNA PORT TEST RESULTS

7.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

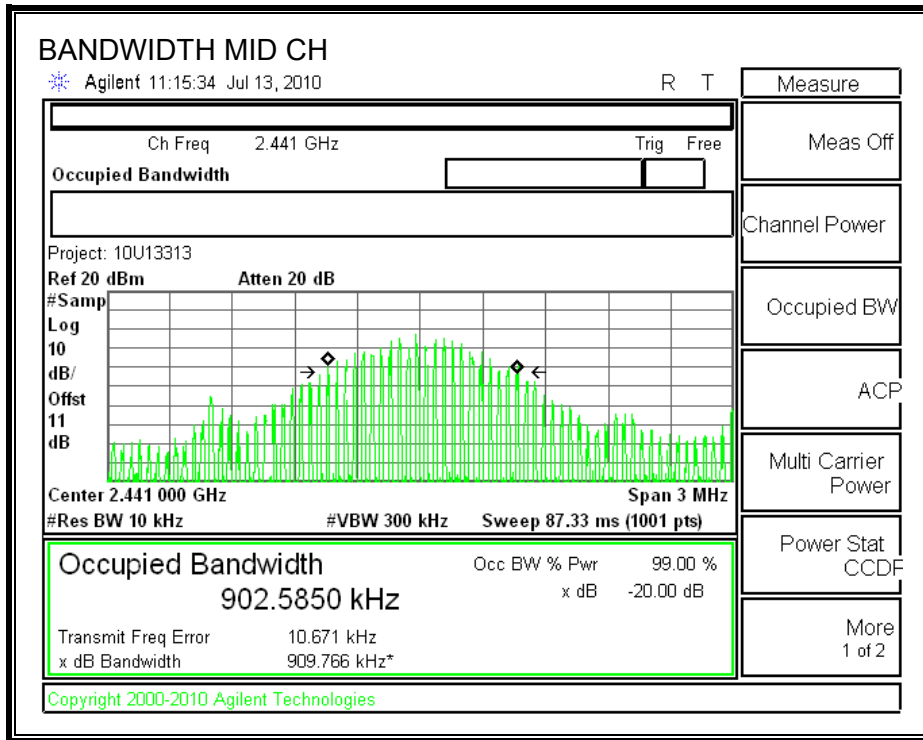
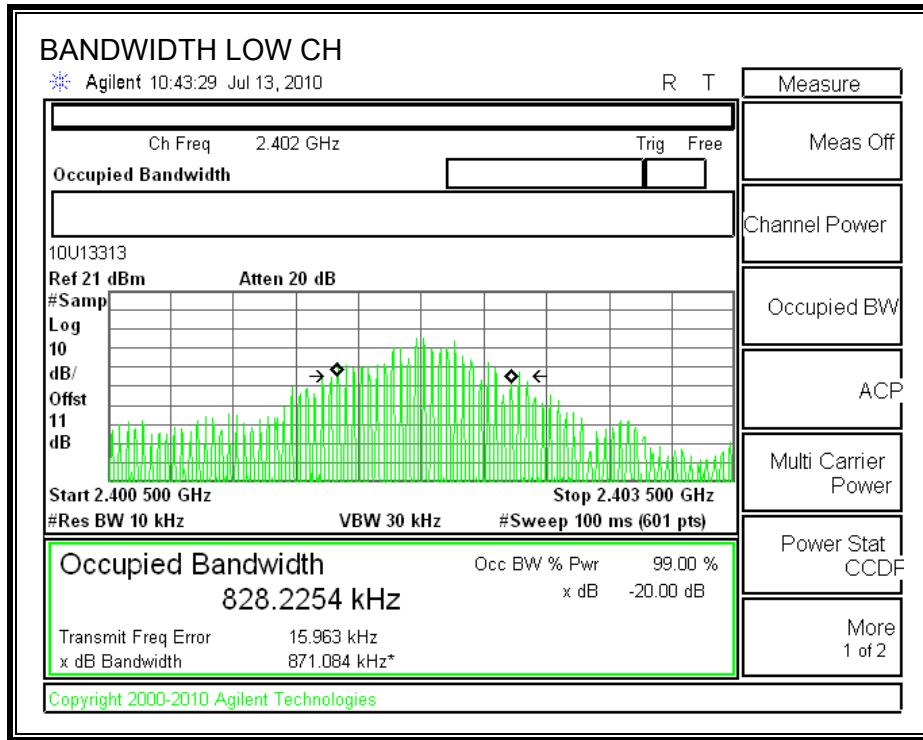
The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

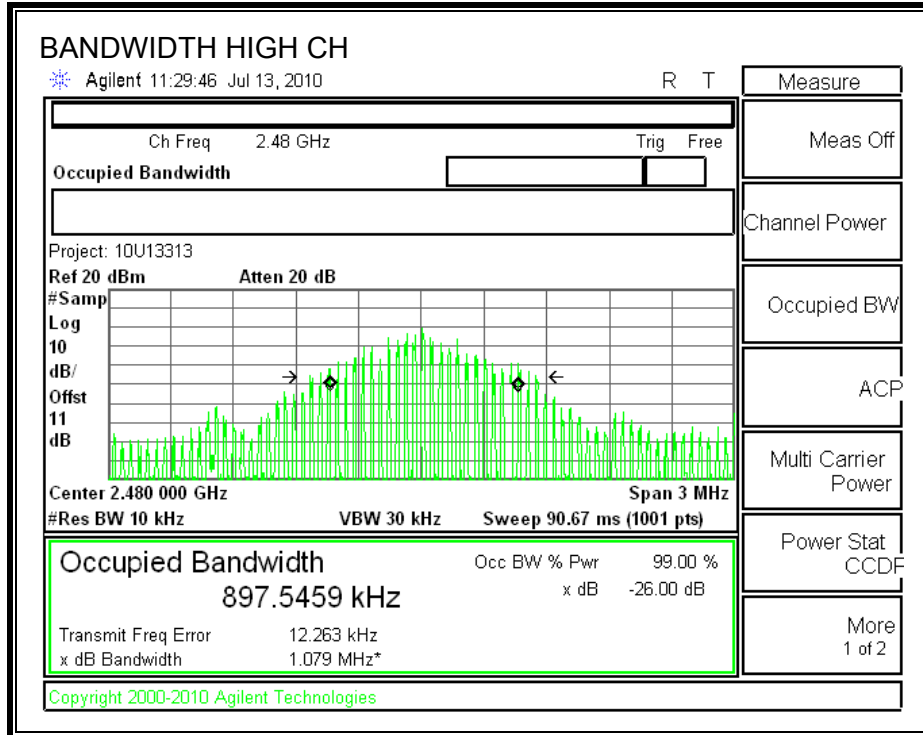
RESULTS

7.1.1. BASIC DATA RATE GFSK MODULATION

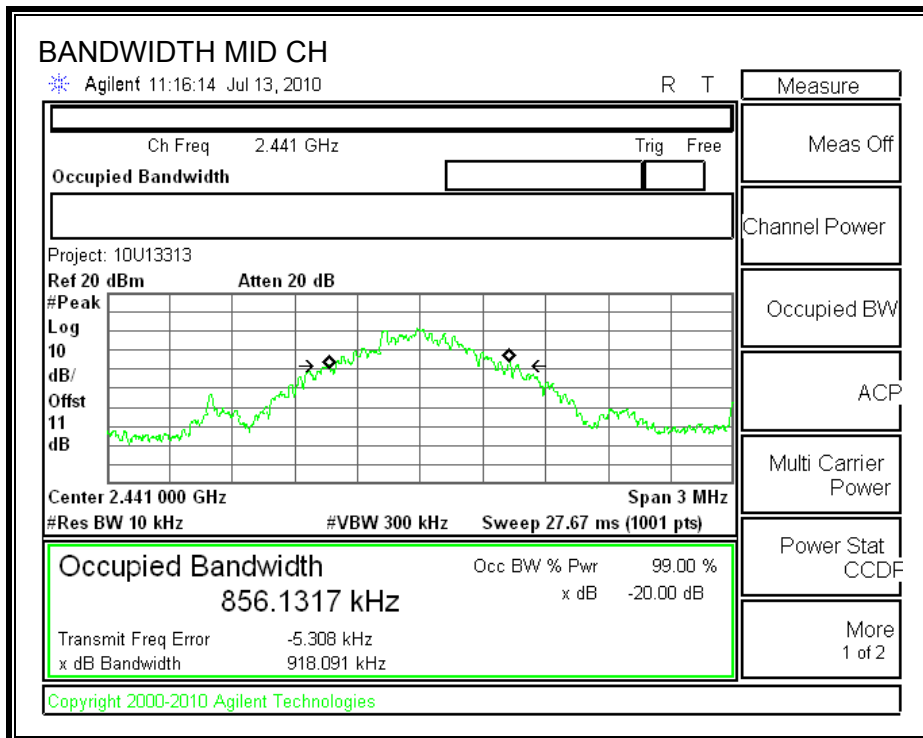
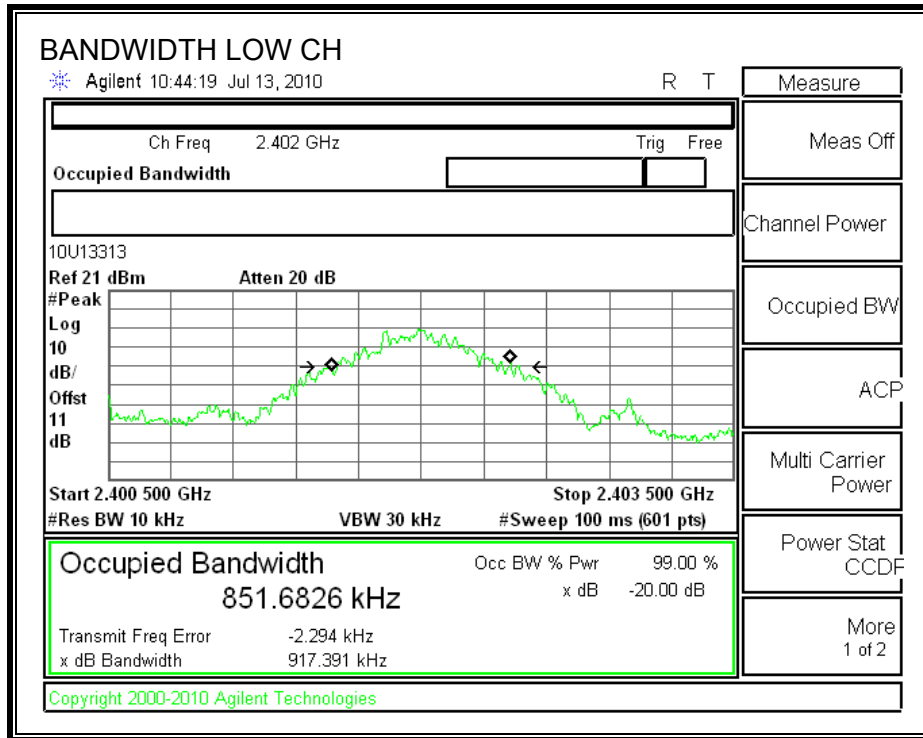
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	917.391	828.2254
Middle	2441	918.091	902.5850
High	2480	1100.000	897.5459

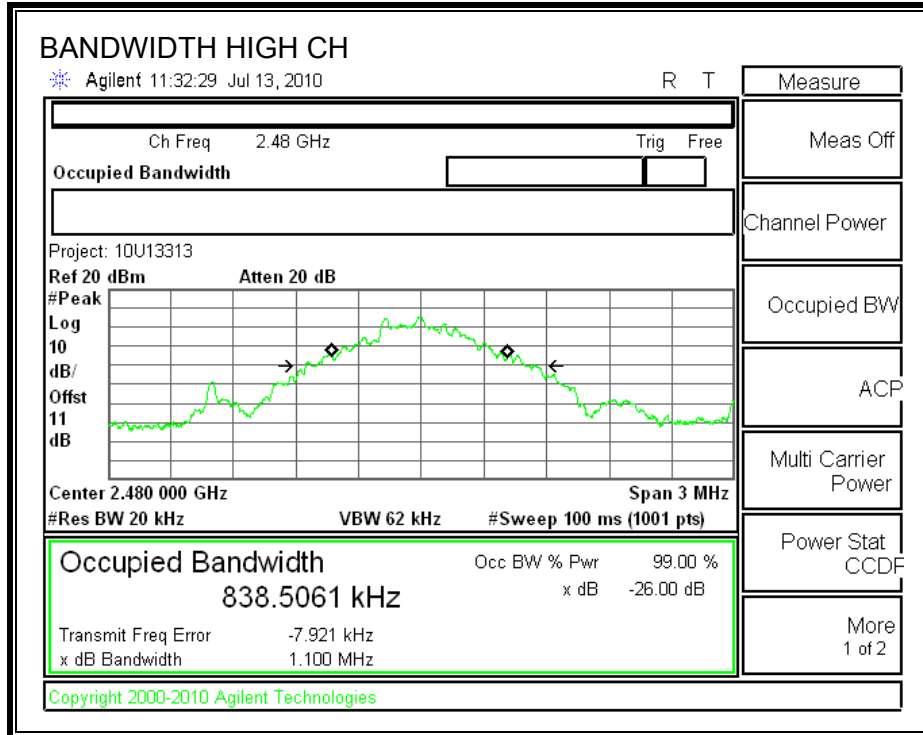
99% BANDWIDTH





20 dB BANDWIDTH

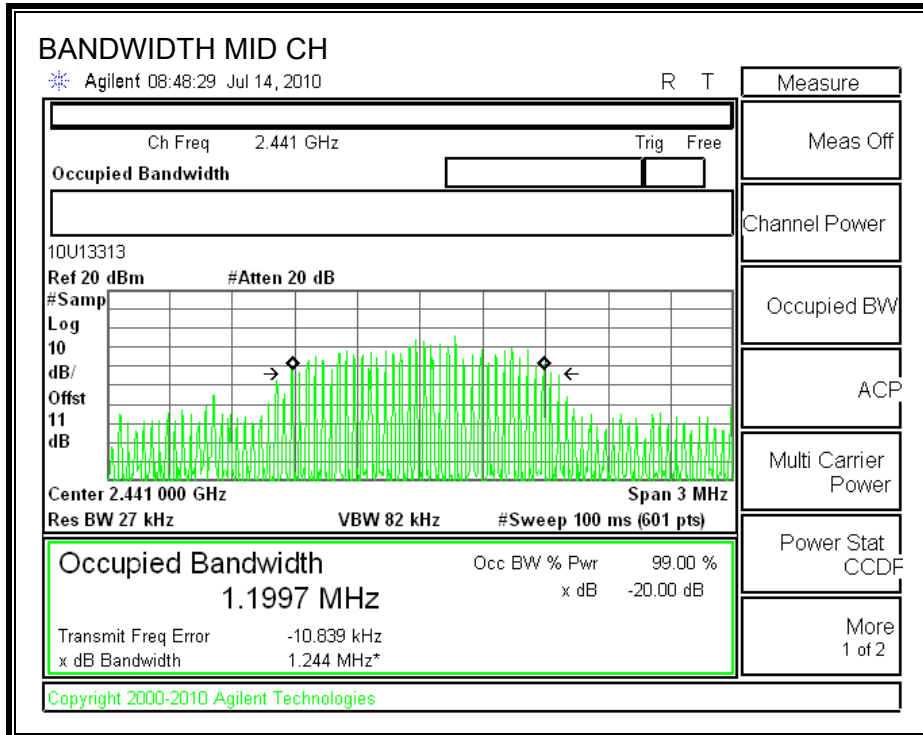
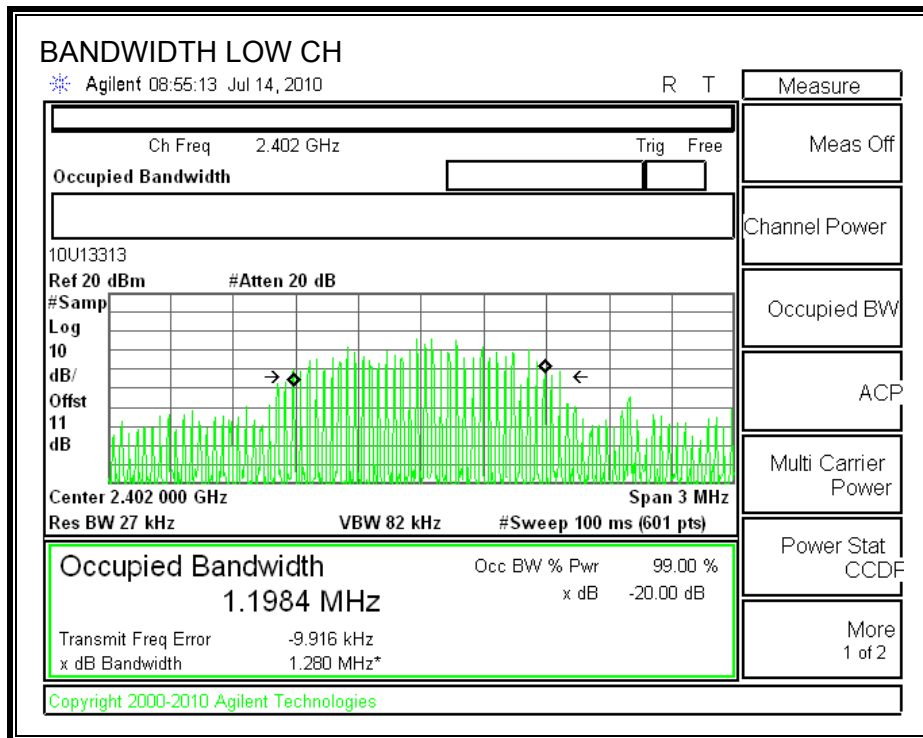




7.1.2. EXTENDED DATA RATE 8PSK MODULATION

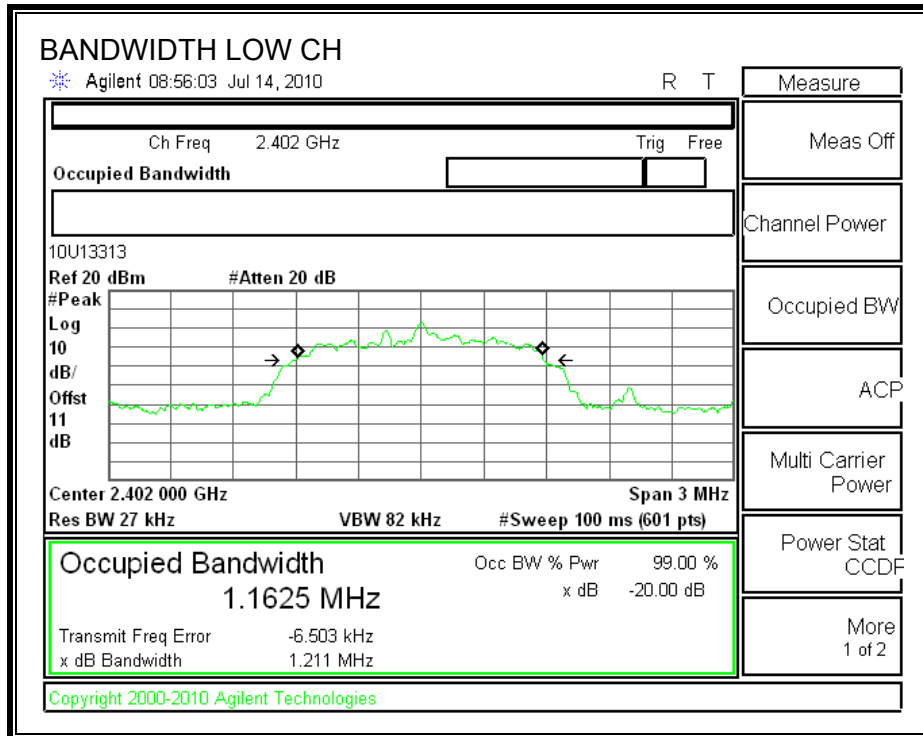
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1211.0	1198.4
Middle	2441	1212.0	1199.7
High	2480	1212.0	1129.4

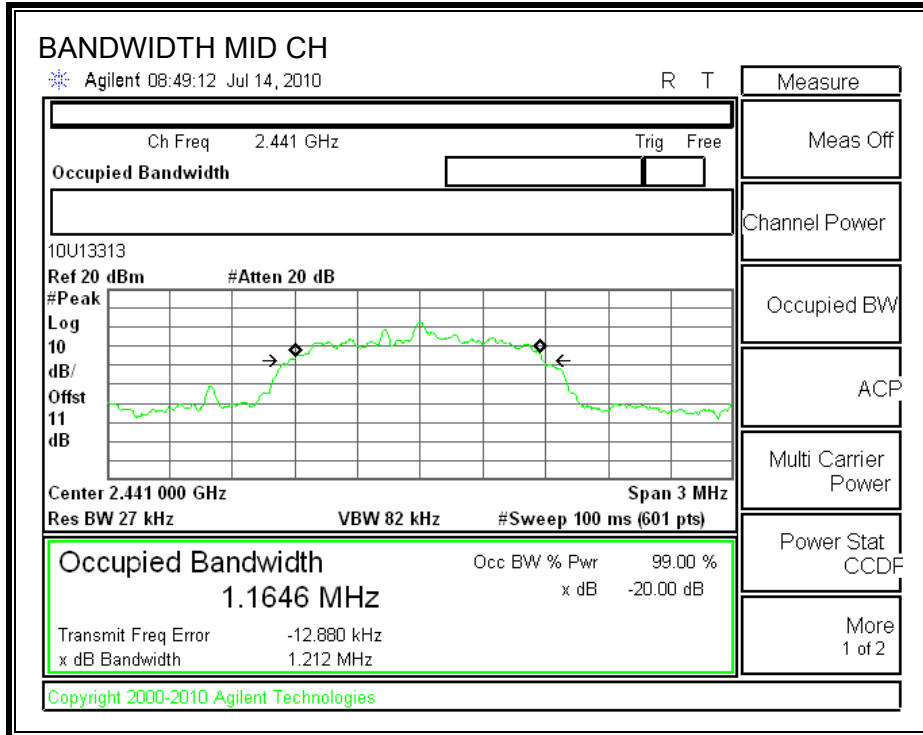
99% BANDWIDTH

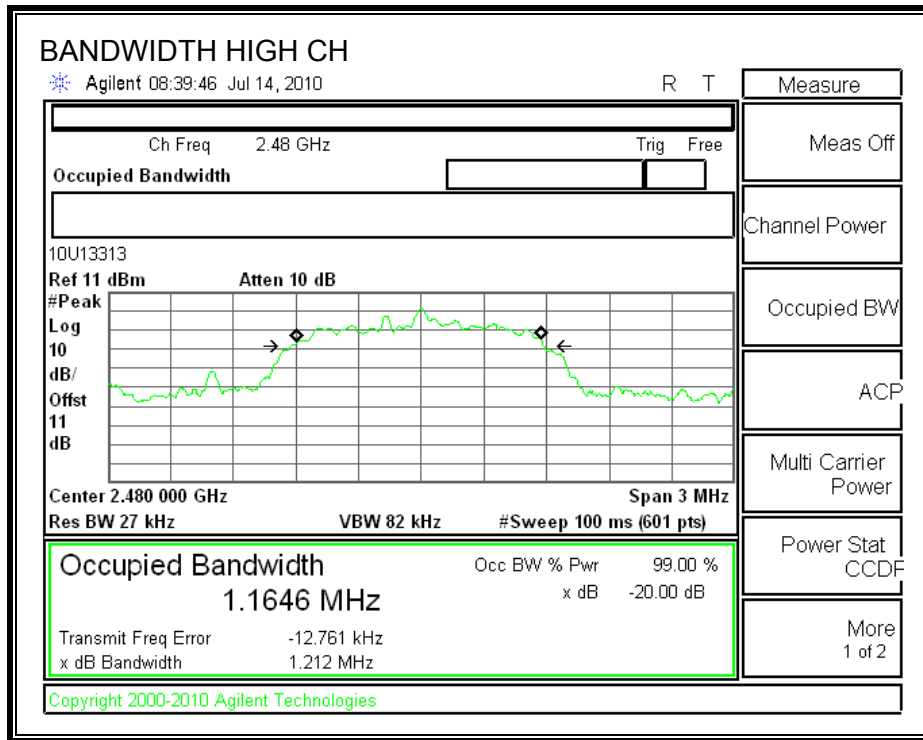




20 dB BANDWIDTH







7.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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

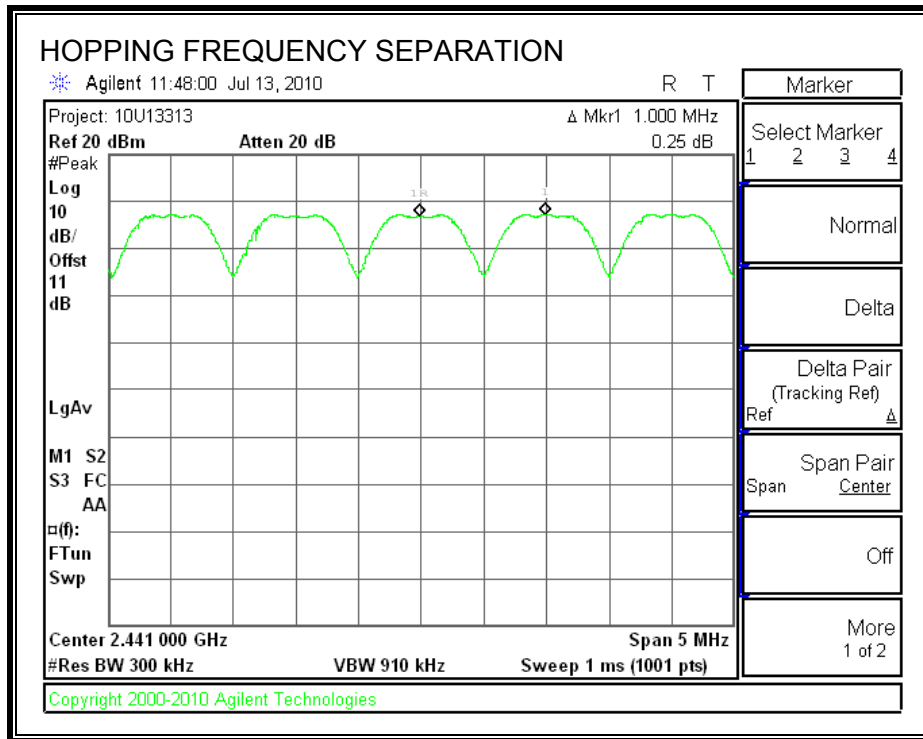
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

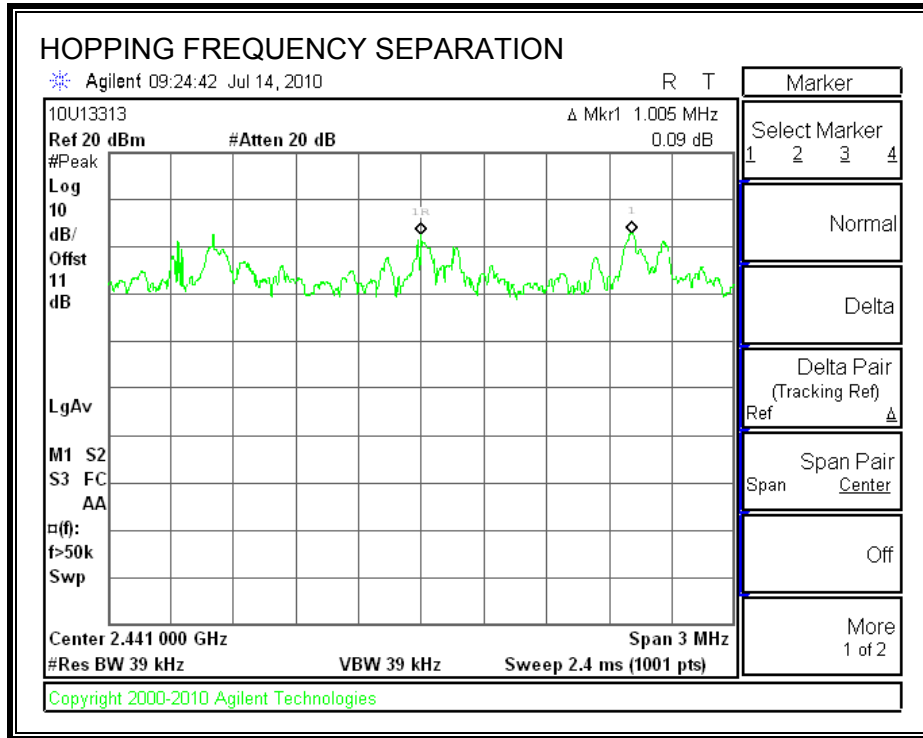
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

RESULTS

7.2.1. BASIC DATA RATE GFSK MODULATION



7.2.2. EXTENDED DATA RATE 8PSK MODULATION



7.3. 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.

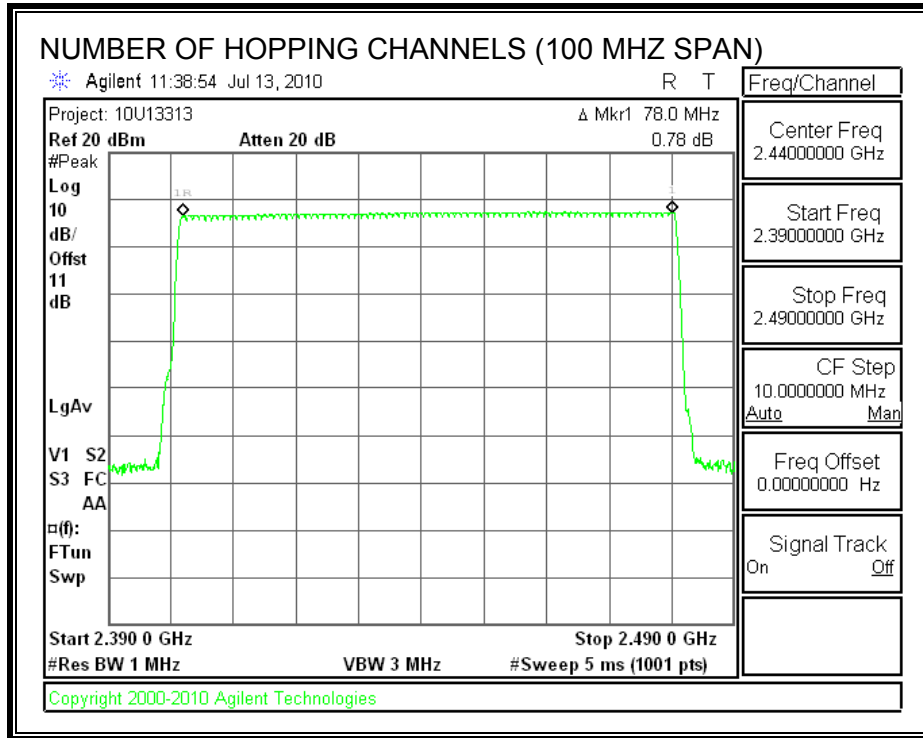
TEST PROCEDURE

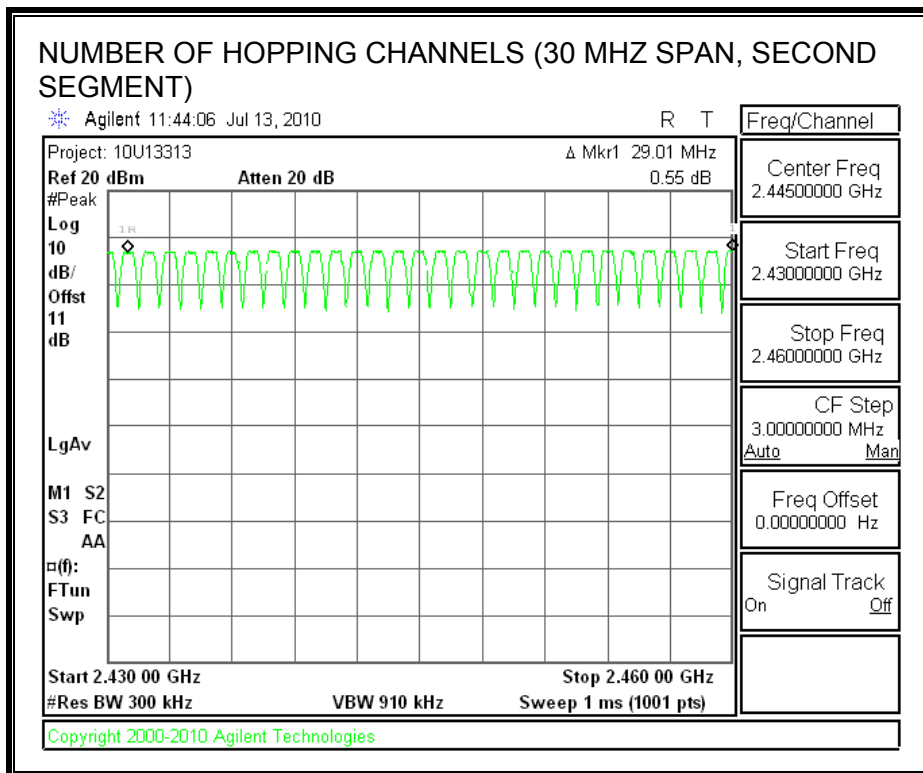
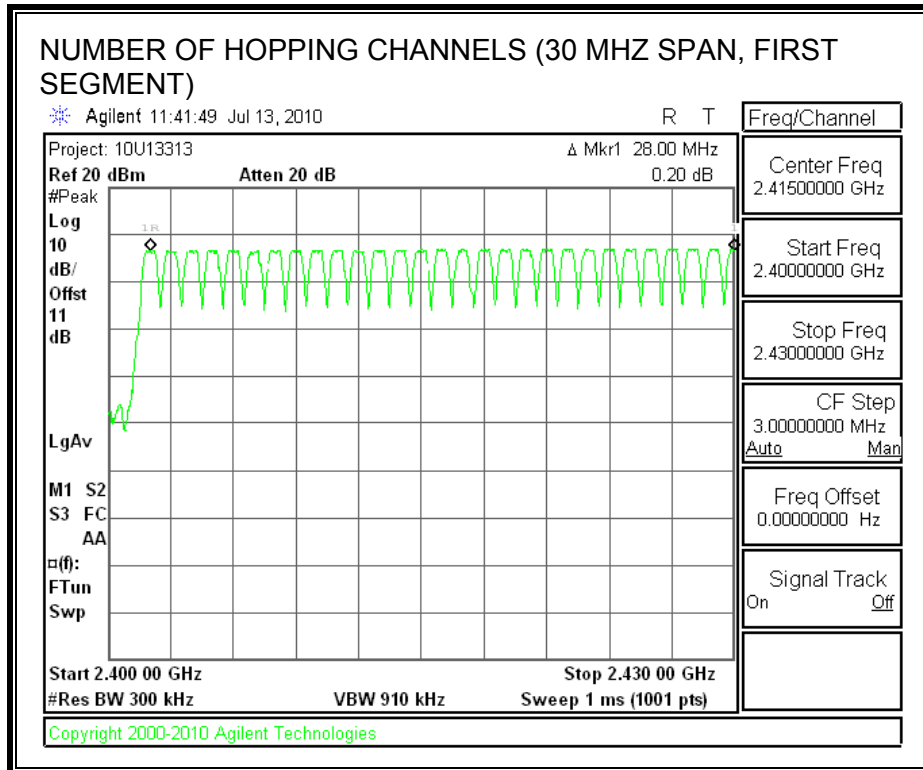
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

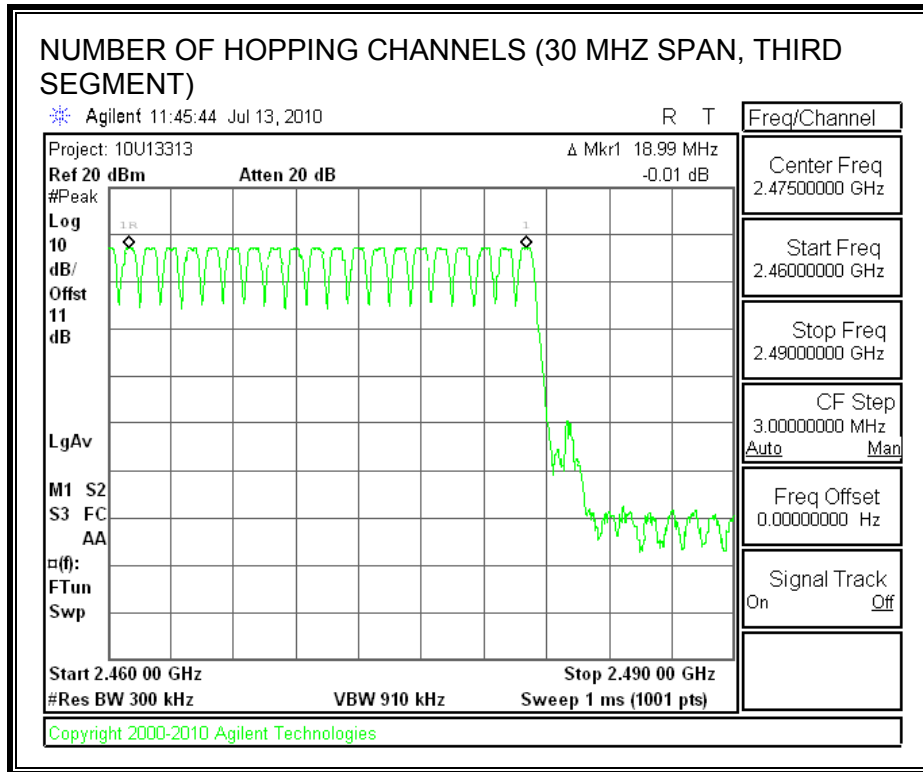
RESULTS

79 Channels observed.

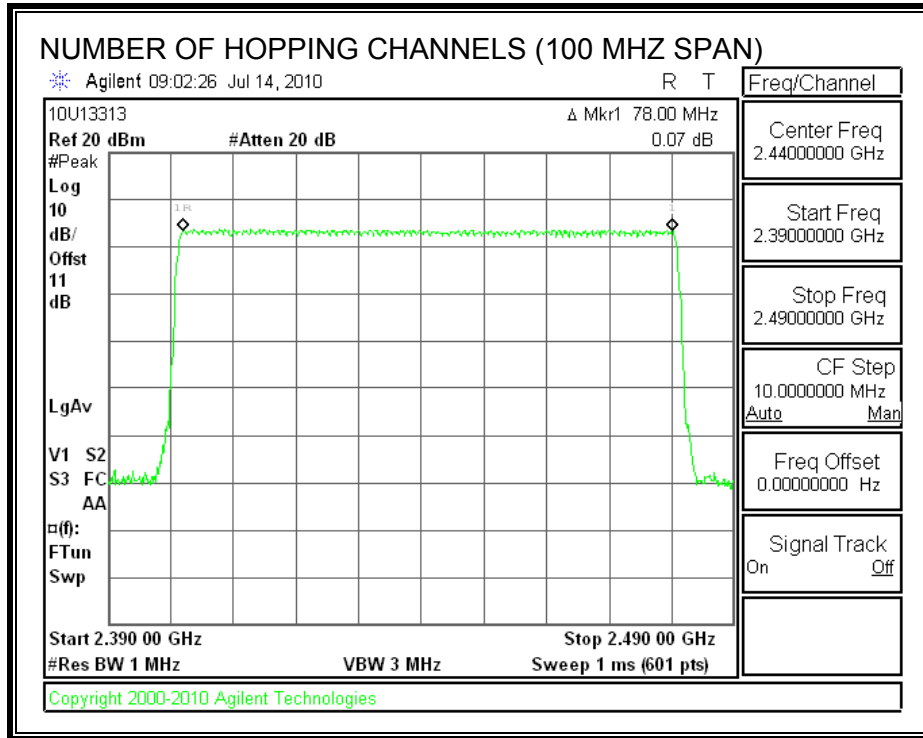
7.3.1. BASIC DATA RATE GFSK MODULATION

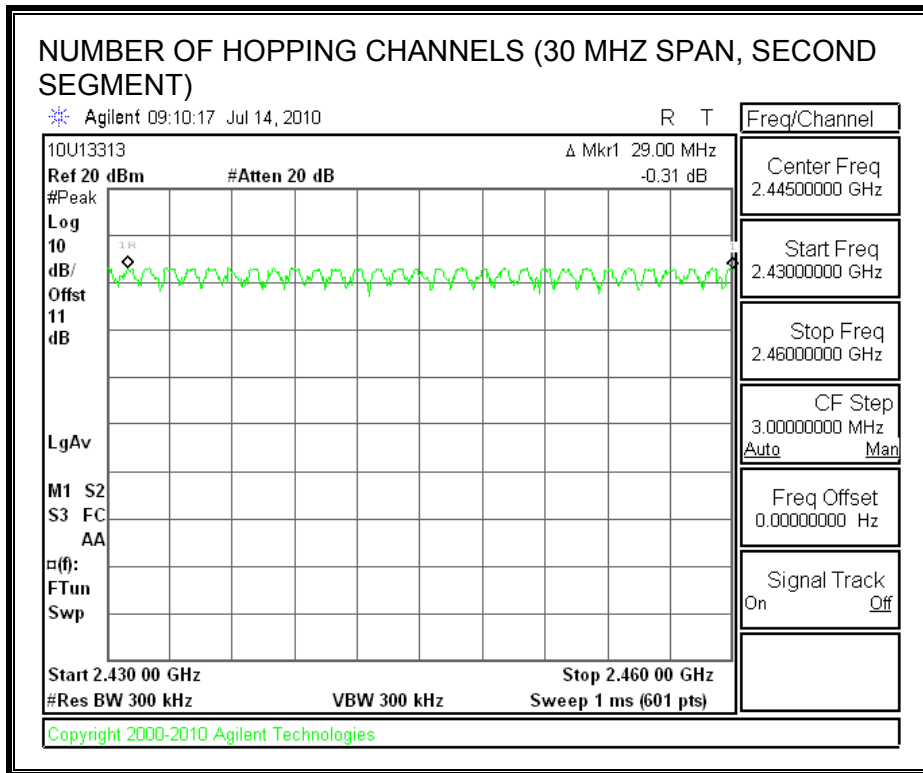
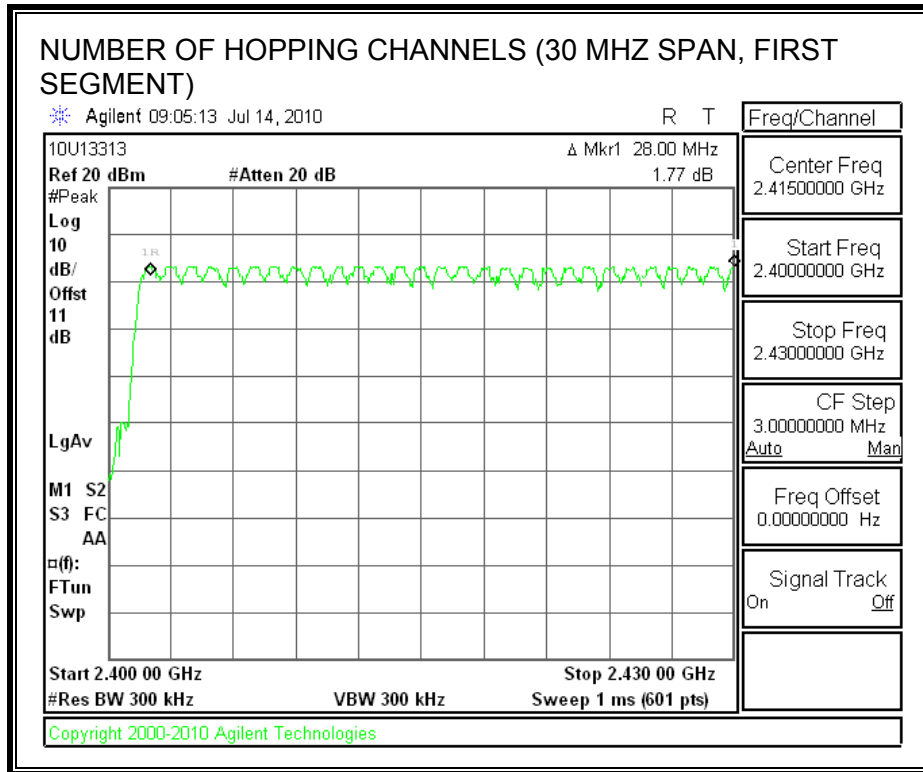


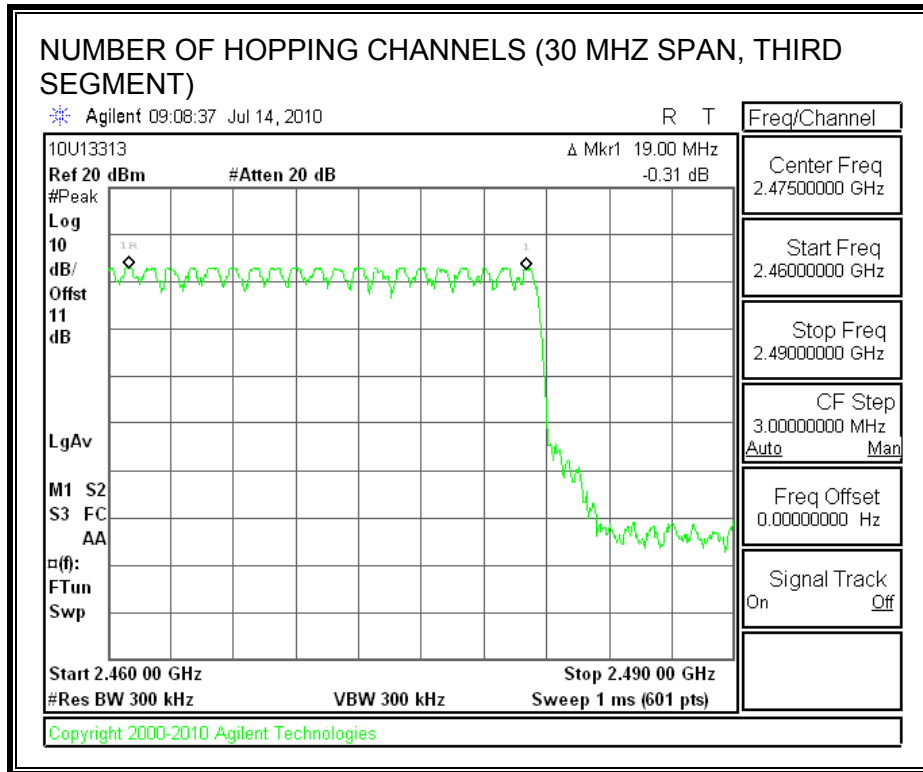




7.3.2. EXTENDED DATA RATE 8PSK MODULATION







7.4. 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 = $10 * xx \text{ pulses} * yy \text{ msec} = zz \text{ msec}$

GFSK Mode

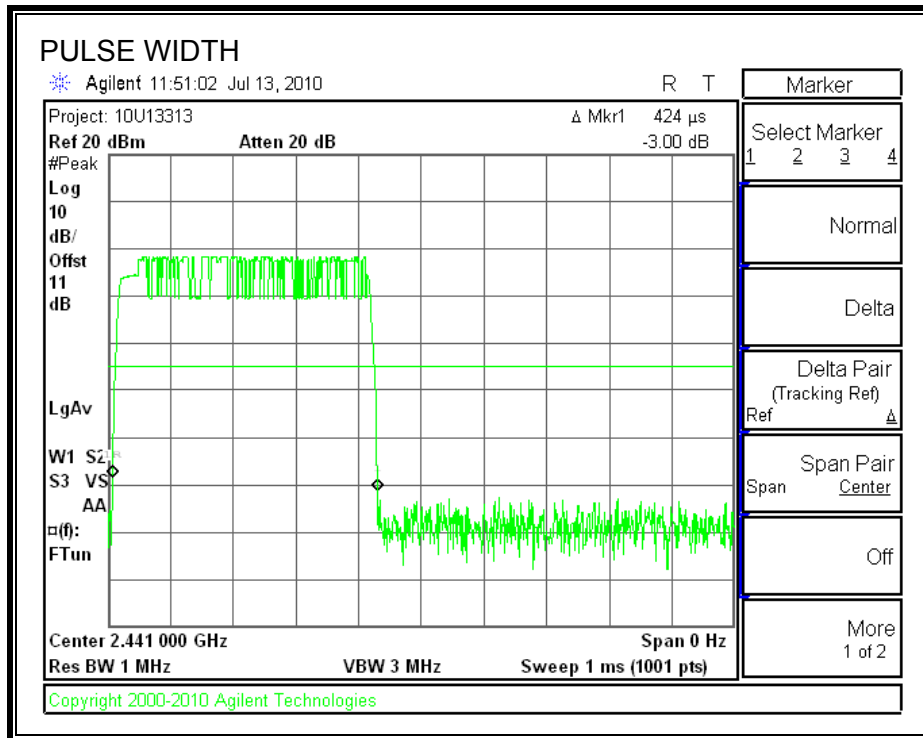
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.424	32	0.136	0.4	0.264

8PSK Mode

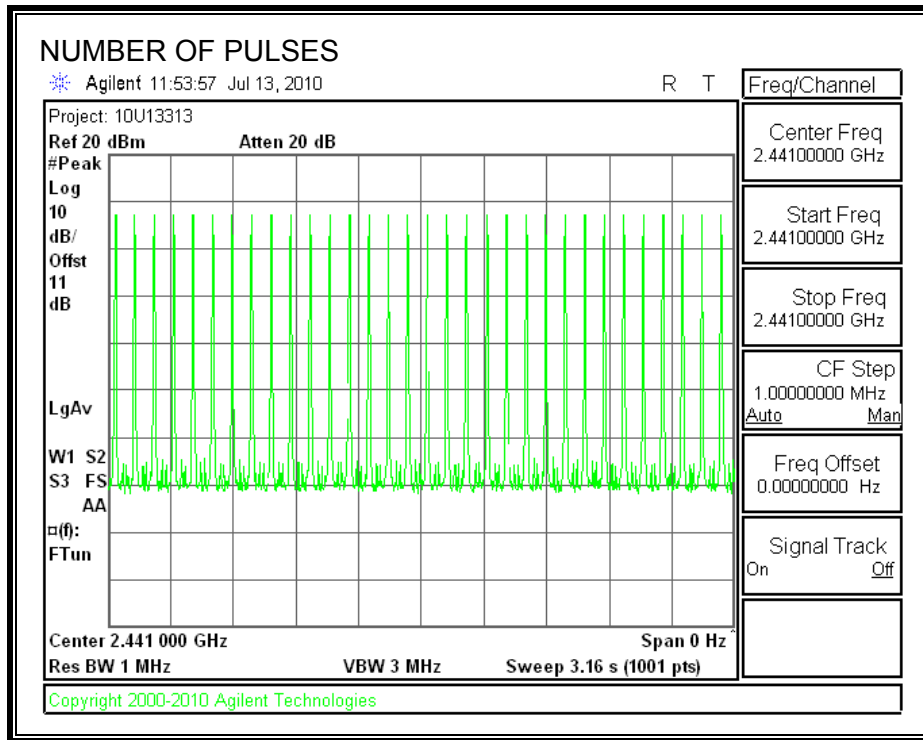
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.425	32	0.136	0.4	0.264

7.4.1. BASIC DATA RATE GFSK MODULATION

PULSE WIDTH

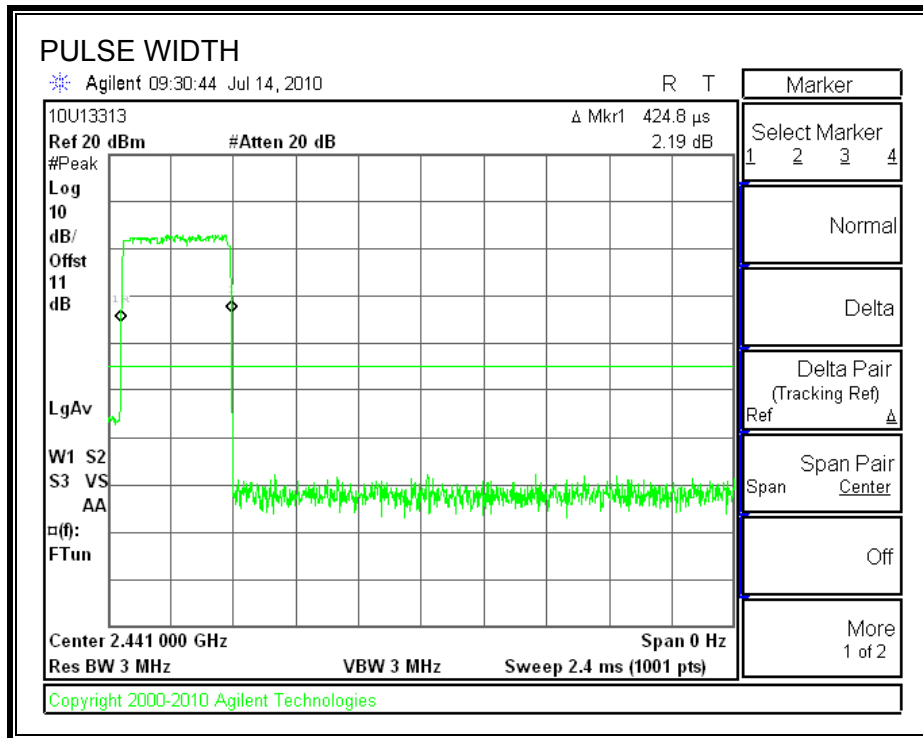


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

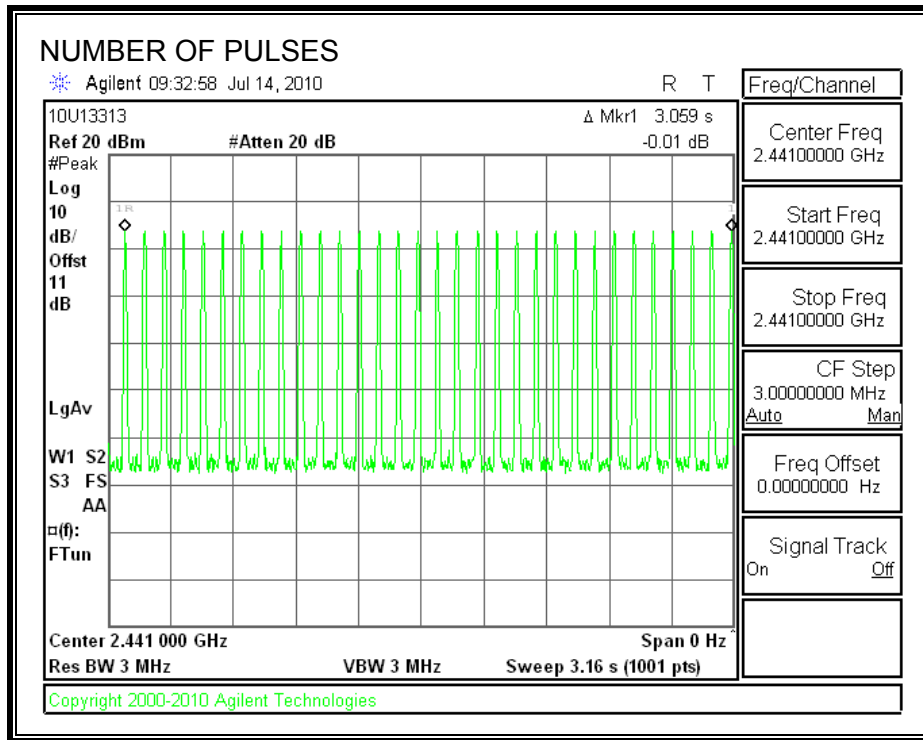


7.4.2. EXTENDED DATA RATE 8PSK MODULATION

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.5. 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

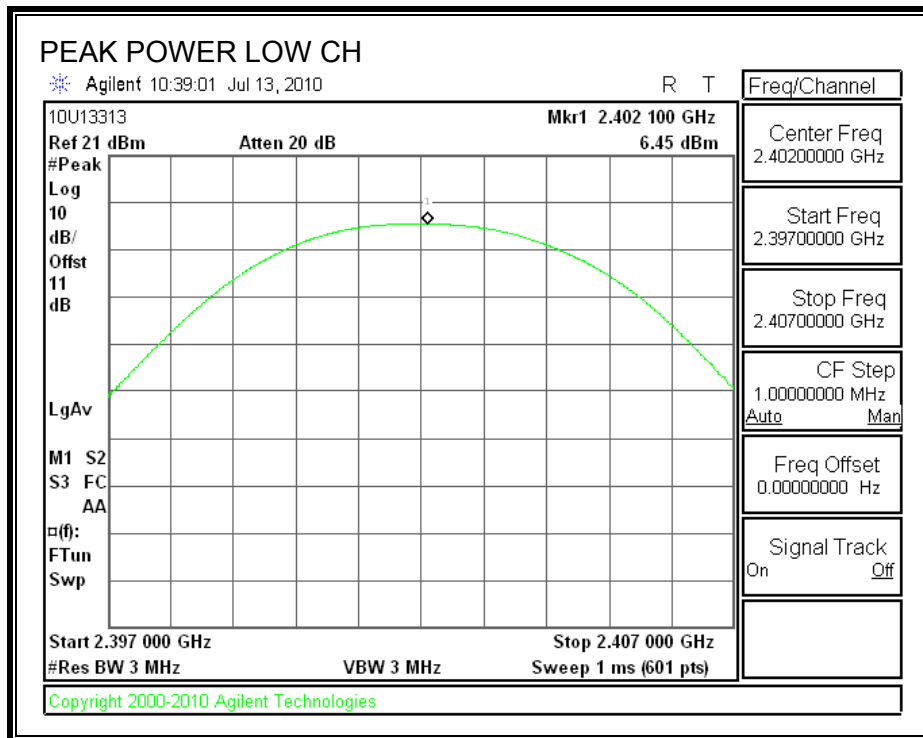
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

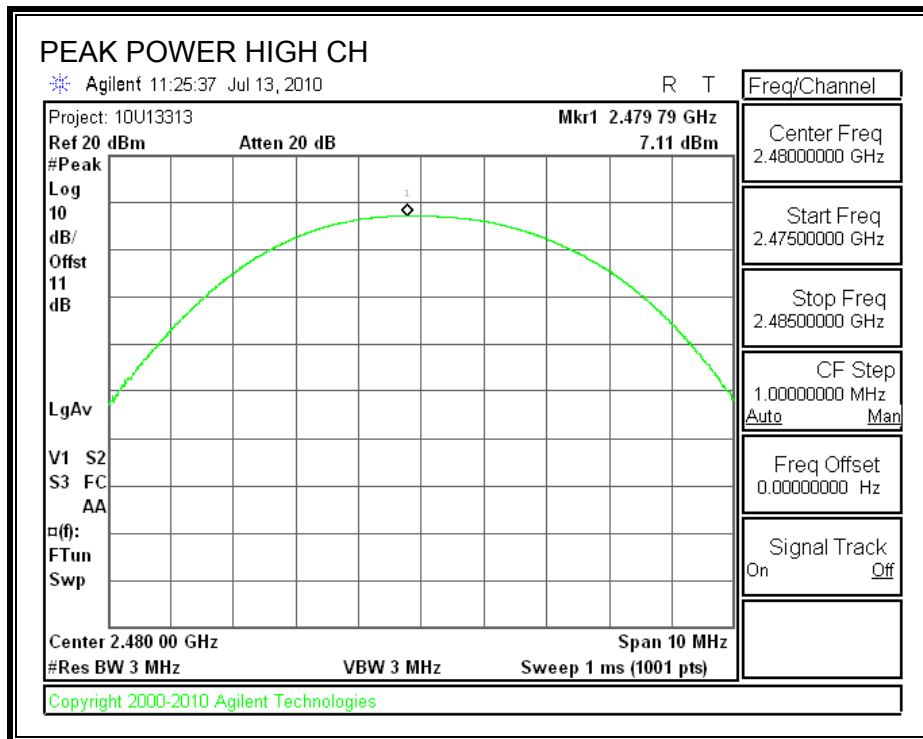
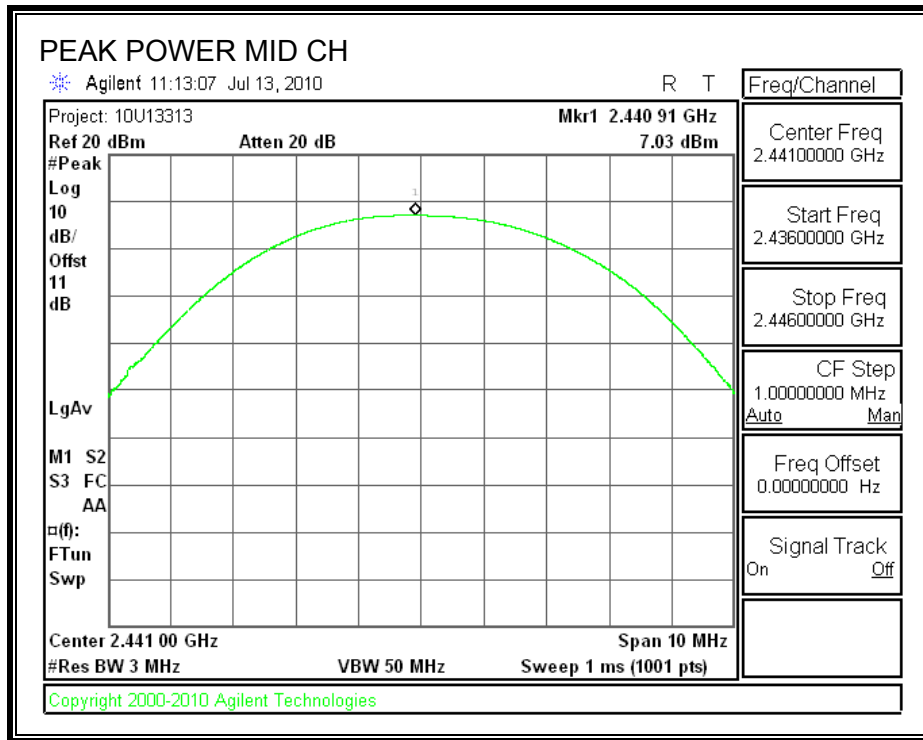
RESULTS

7.5.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	6.45	30	-23.55
Middle	2441	7.03	30	-22.97
High	2480	7.11	30	-22.89

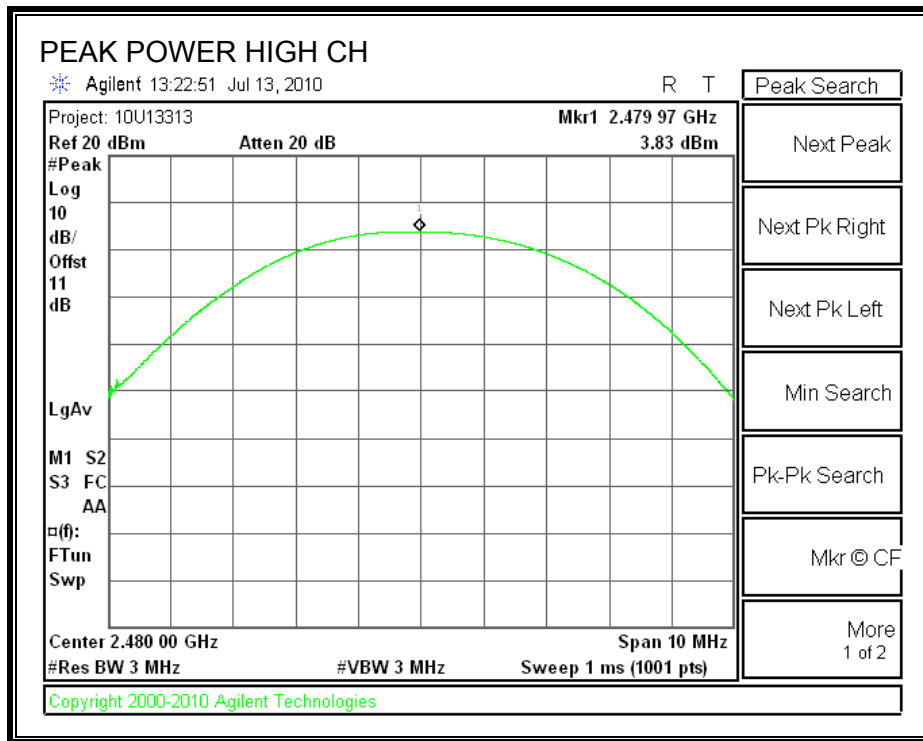
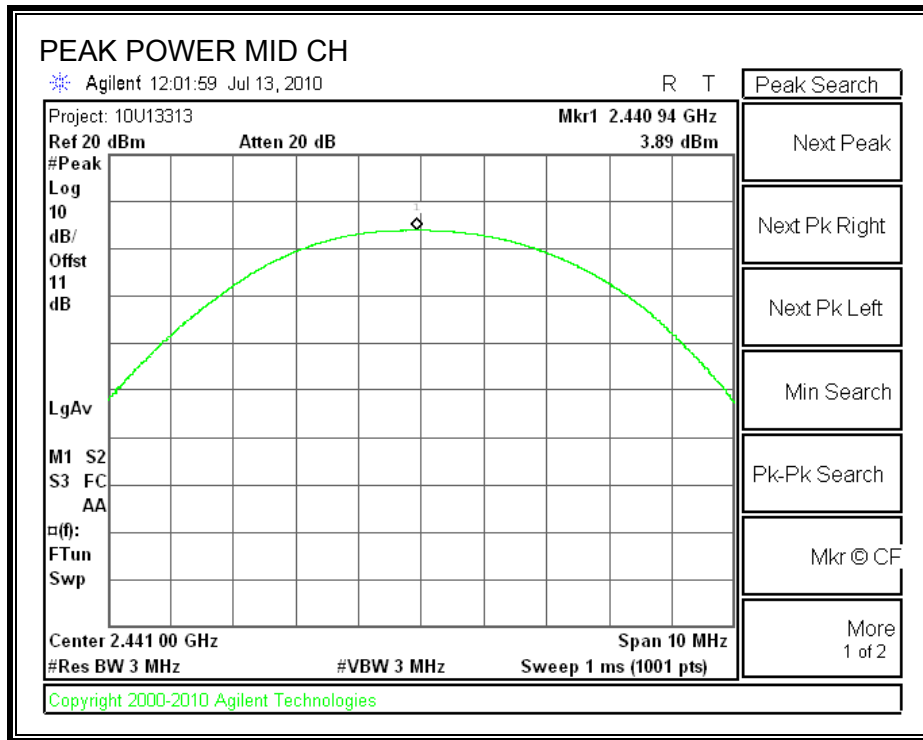
OUTPUT POWER





7.5.2. EXTENDED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.07	30	-25.93
Middle	2441	3.89	30	-26.11
High	2480	3.83	30	-26.17



7.6. 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 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

7.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	2.70
Middle	2441	3.03
High	2480	3.00

7.6.2. EXTENDED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	1.74
Middle	2441	1.41
High	2480	1.27

7.7. 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.

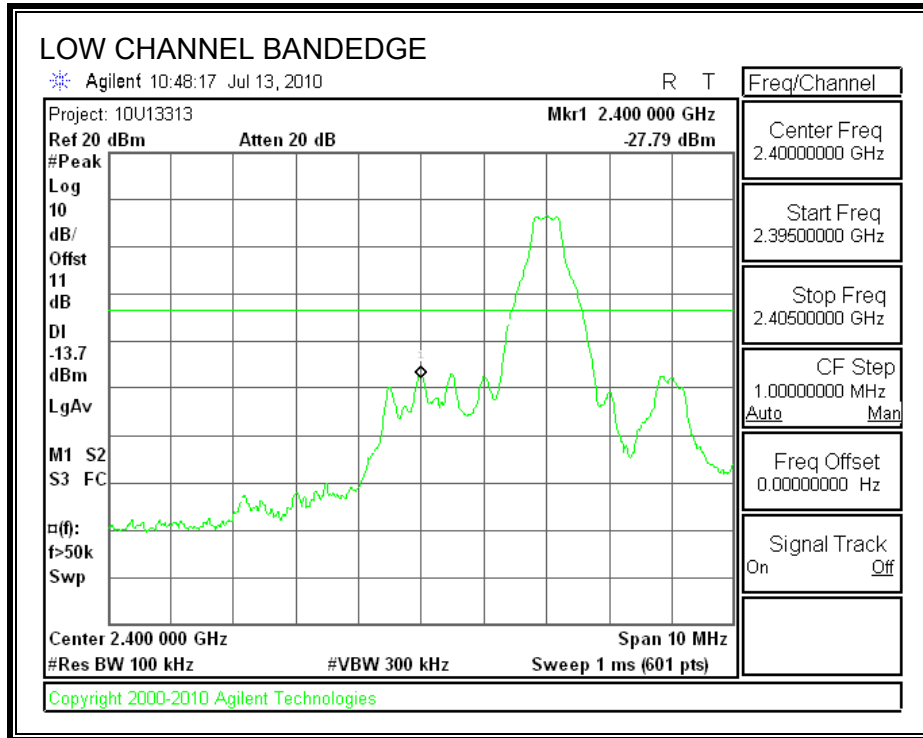
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

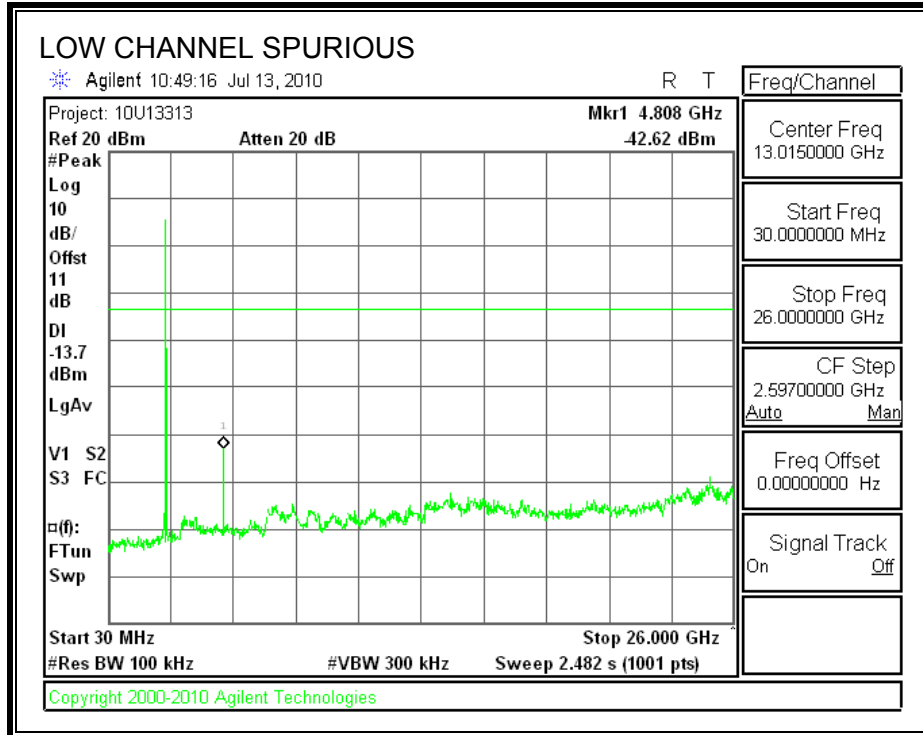
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

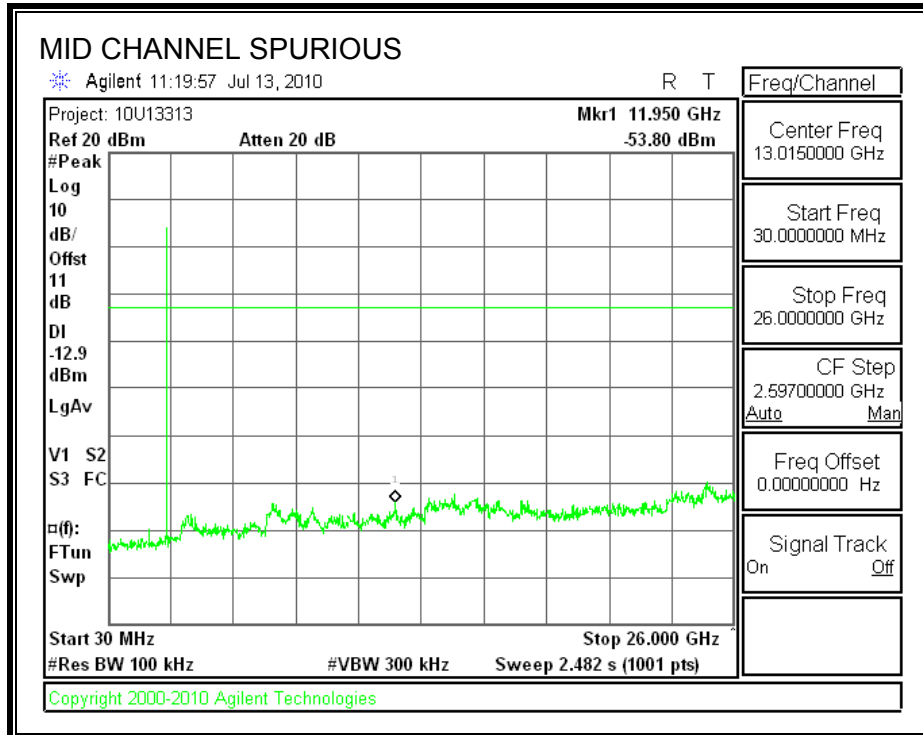
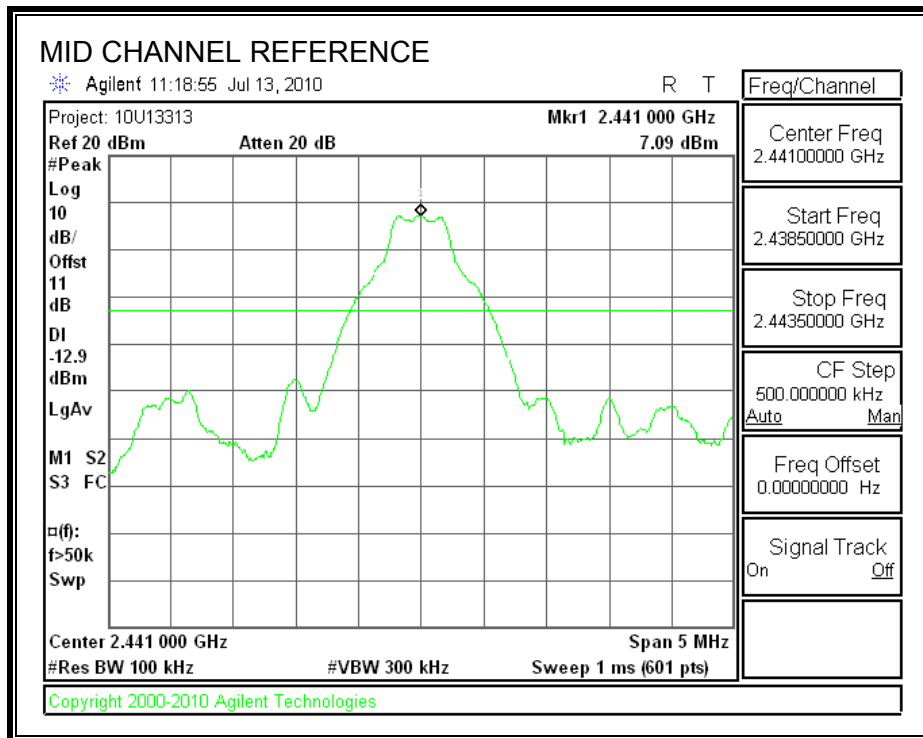
7.7.1. BASIC DATA RATE GFSK MODULATION

SPURIOUS EMISSIONS, LOW CHANNEL

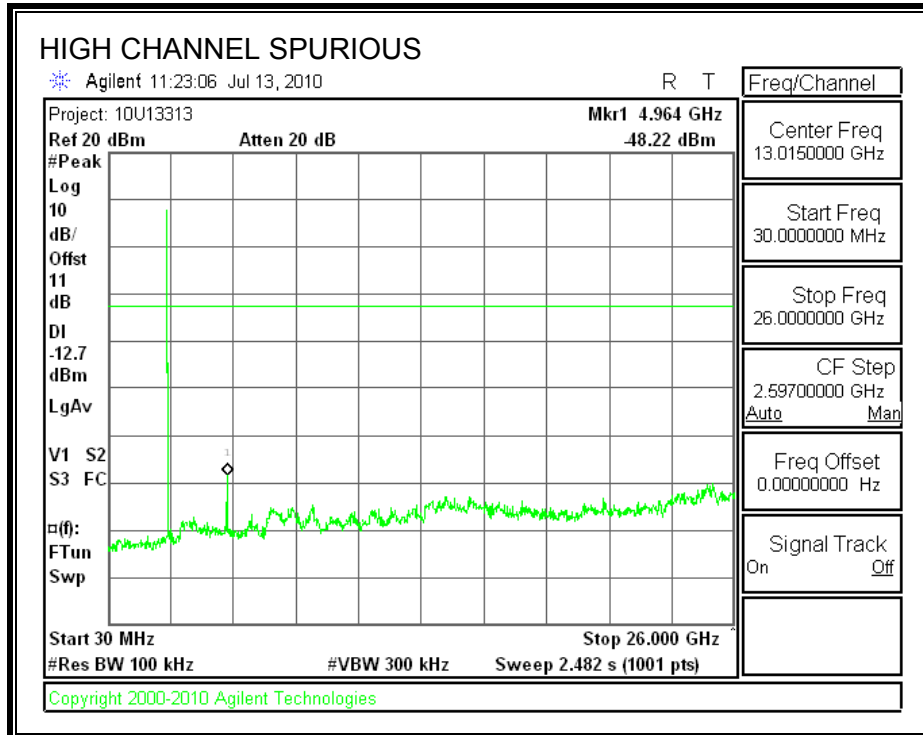
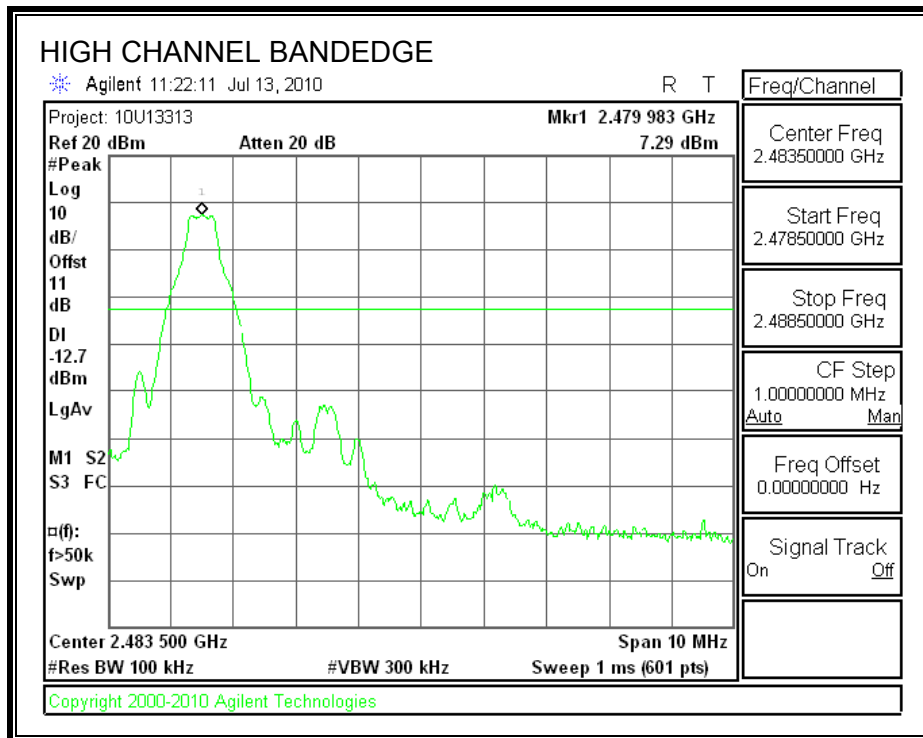




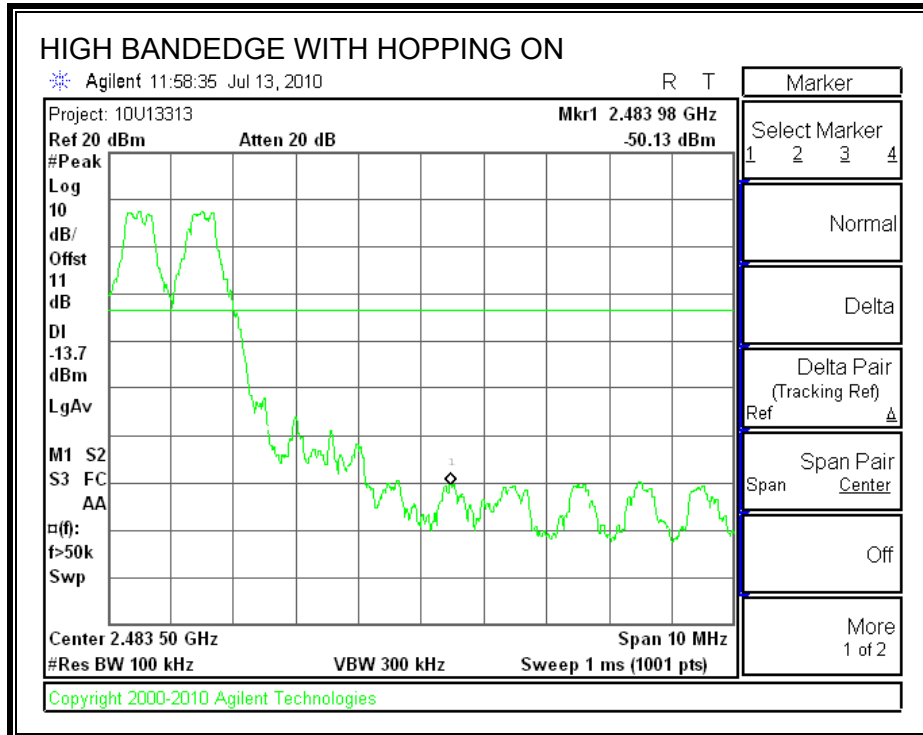
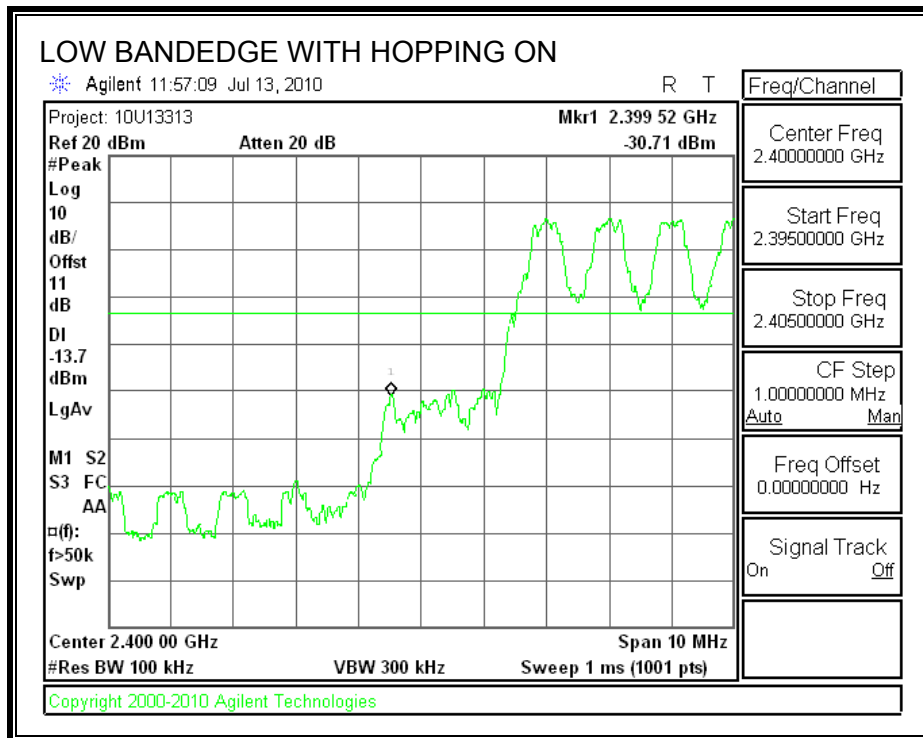
SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL

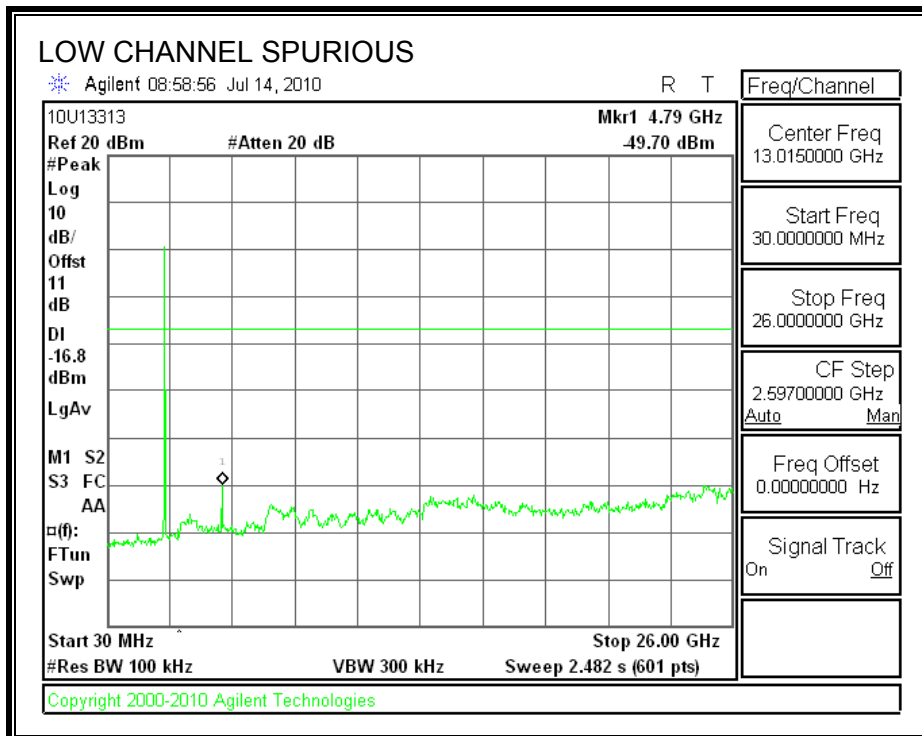
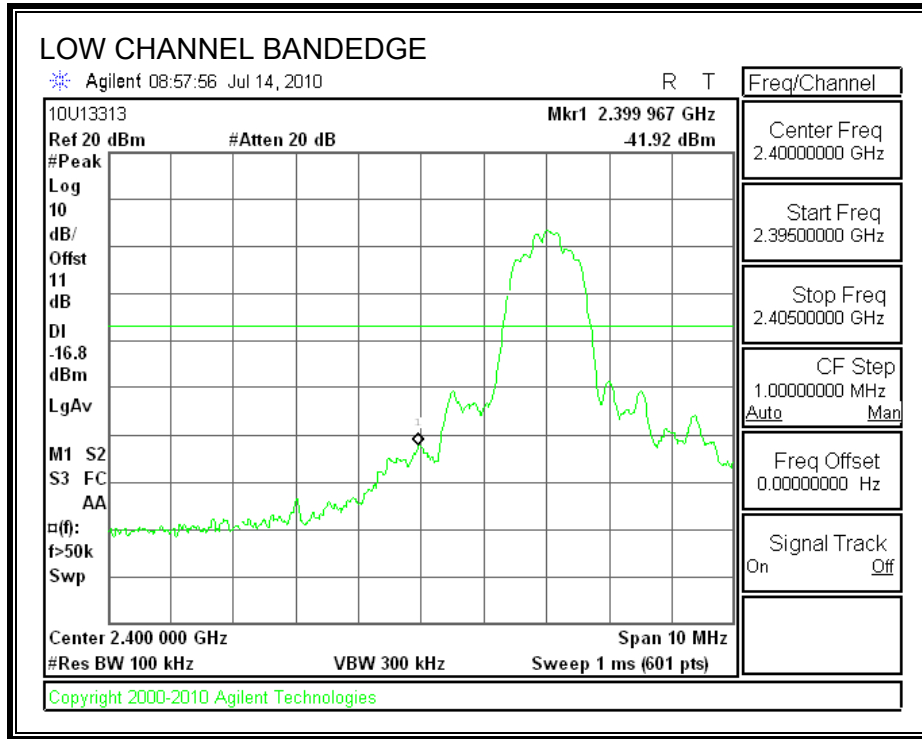


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

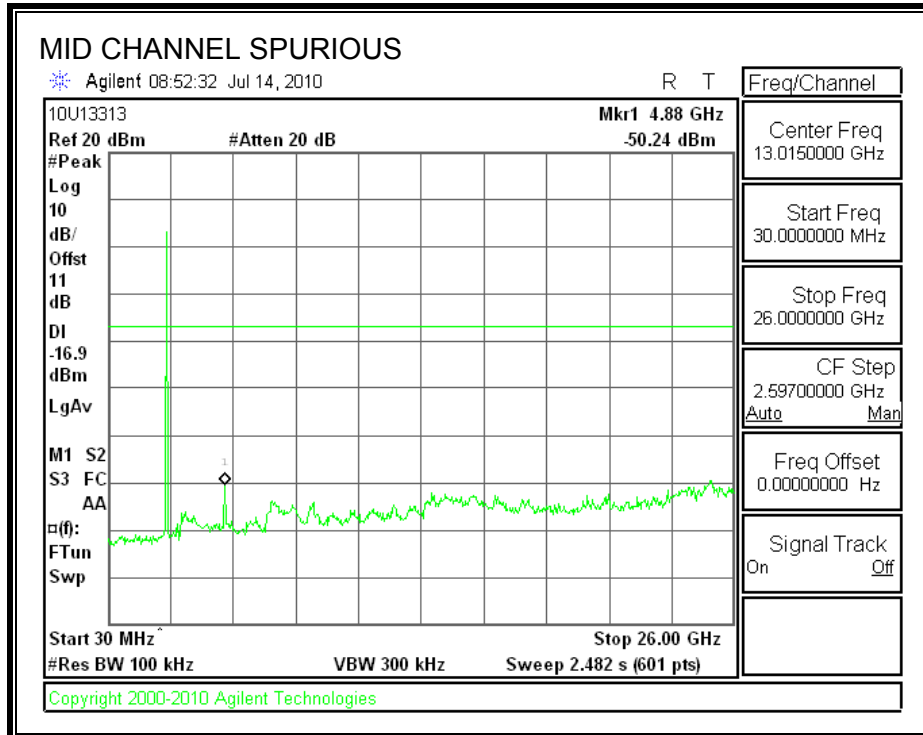
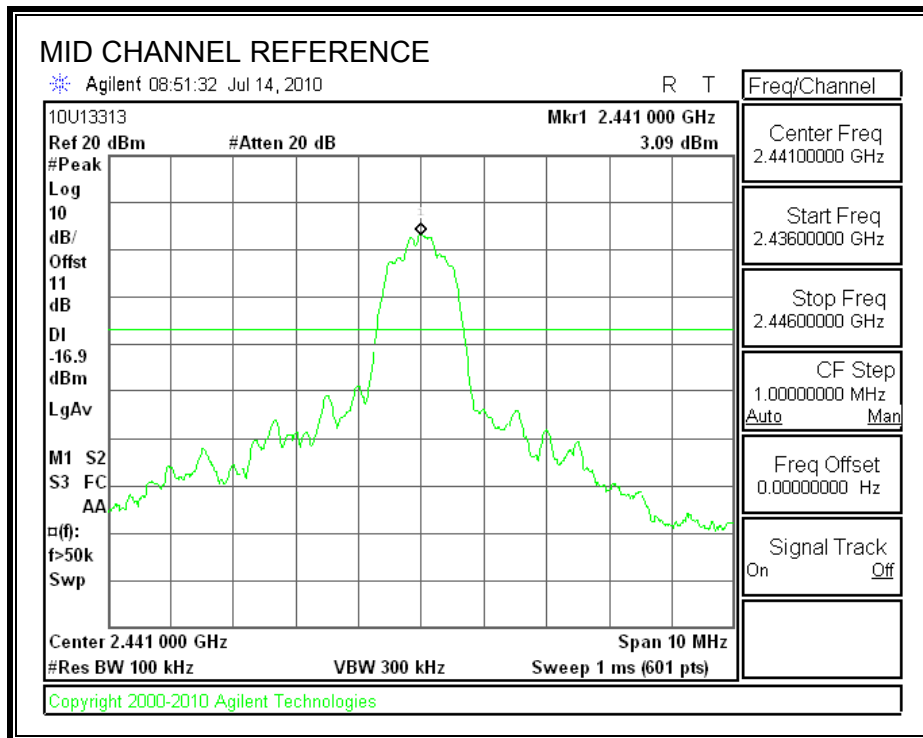


7.7.2. EXTENDED DATA RATE 8PSK MODULATION

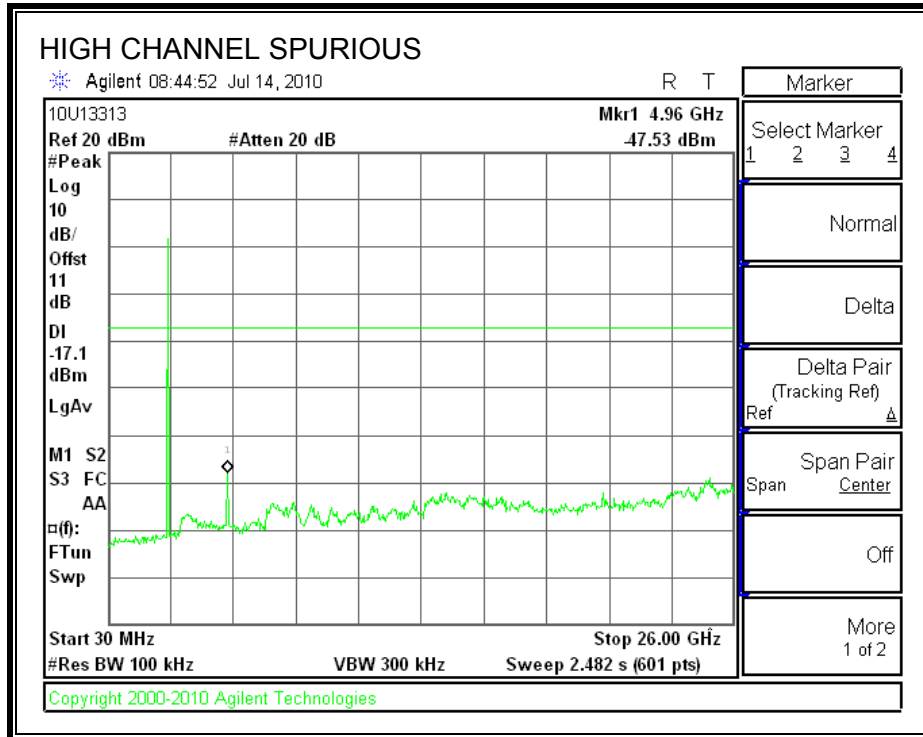
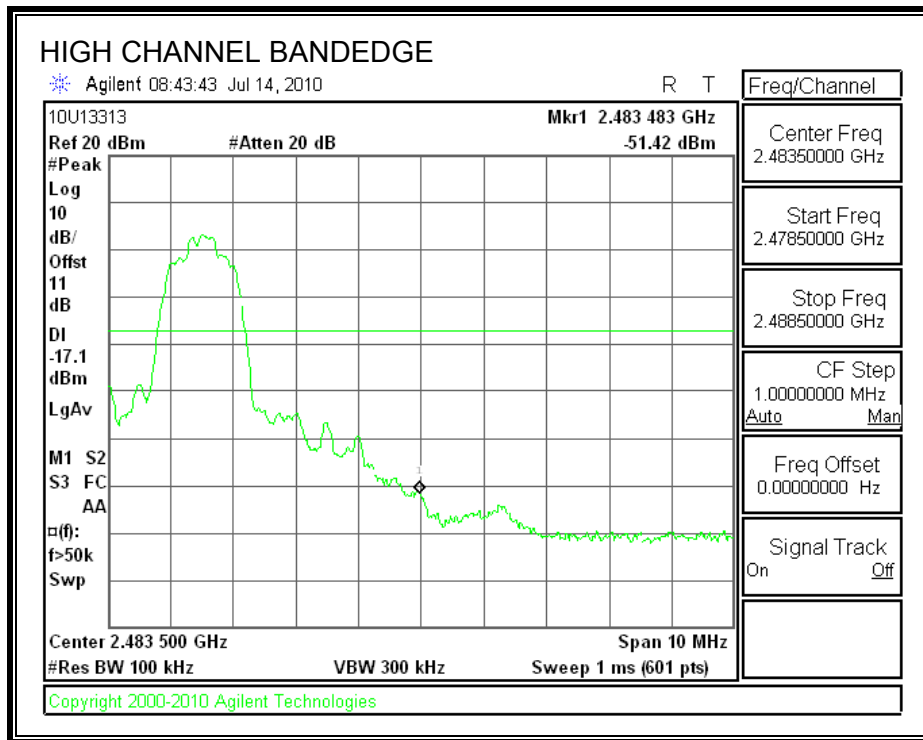
SPURIOUS EMISSIONS, LOW CHANNEL



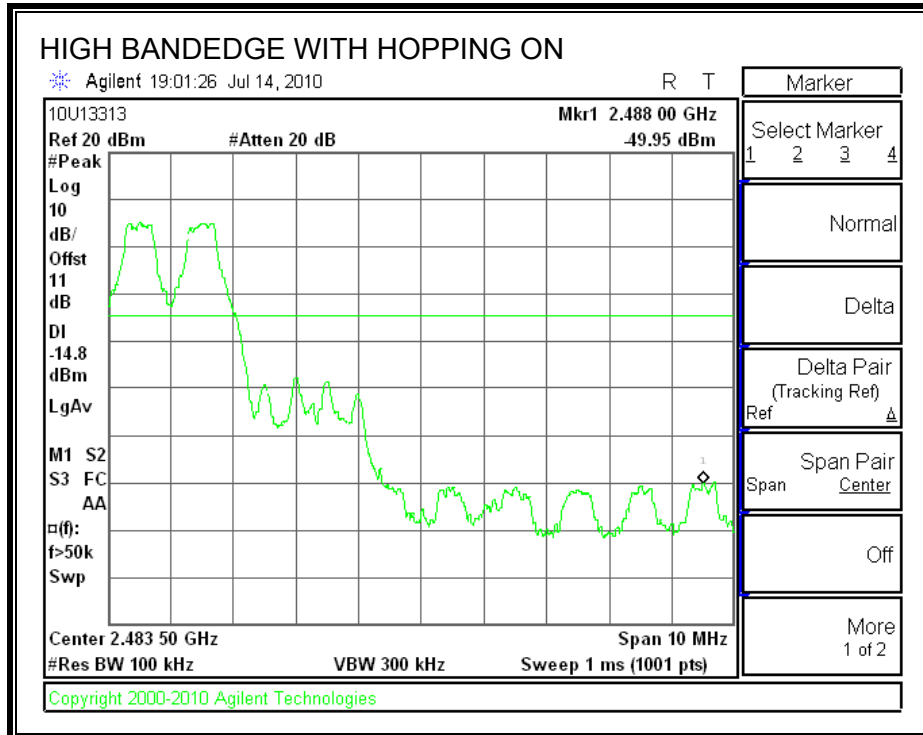
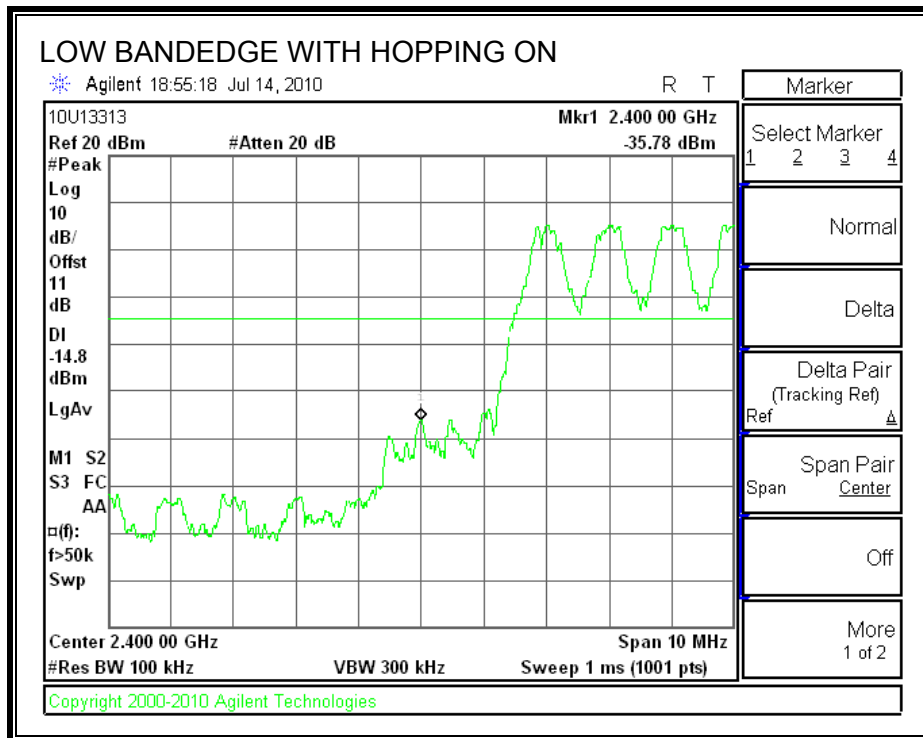
SPURIOUS EMISSIONS, MID CHANNEL



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.

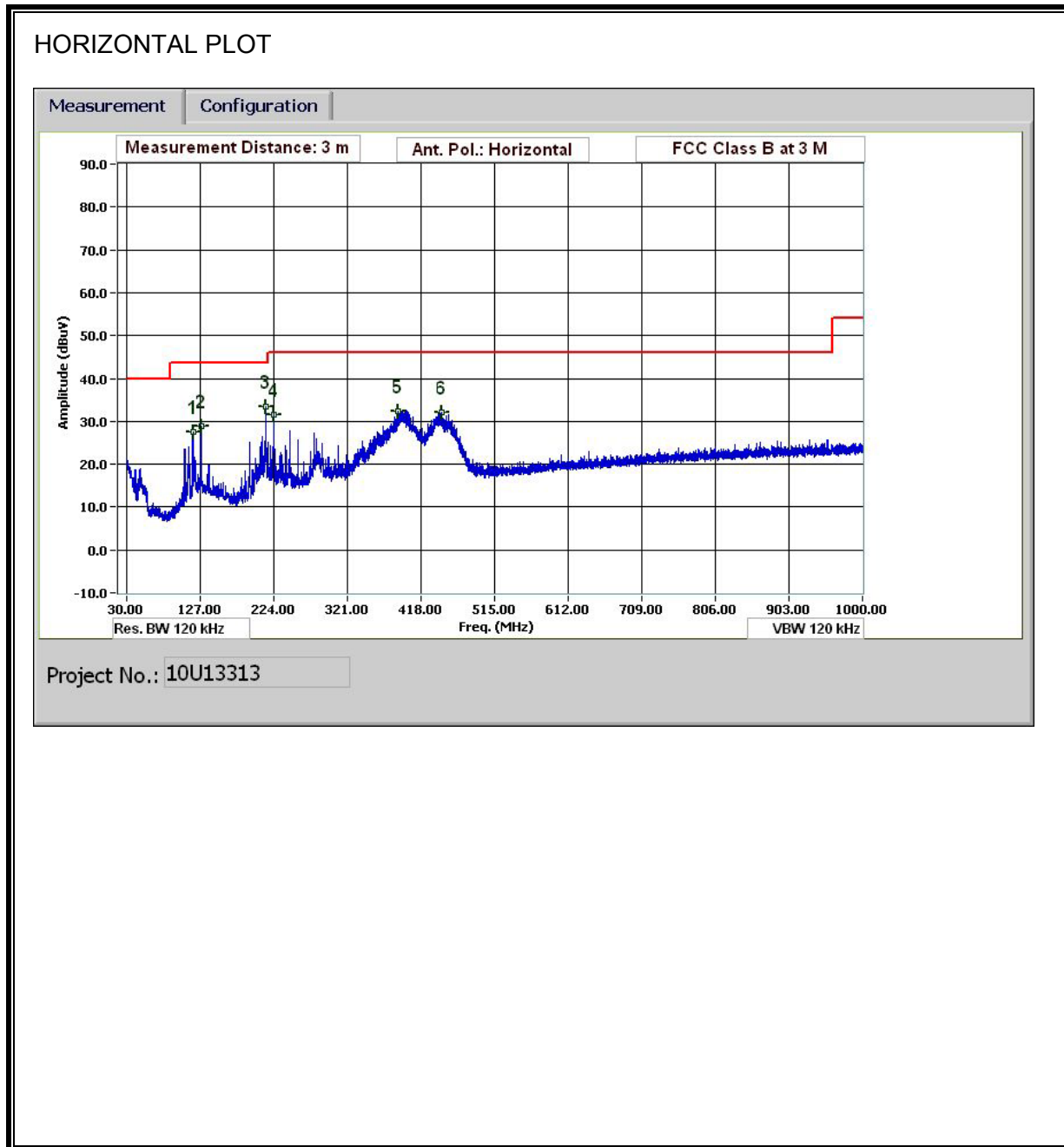
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

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. 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)



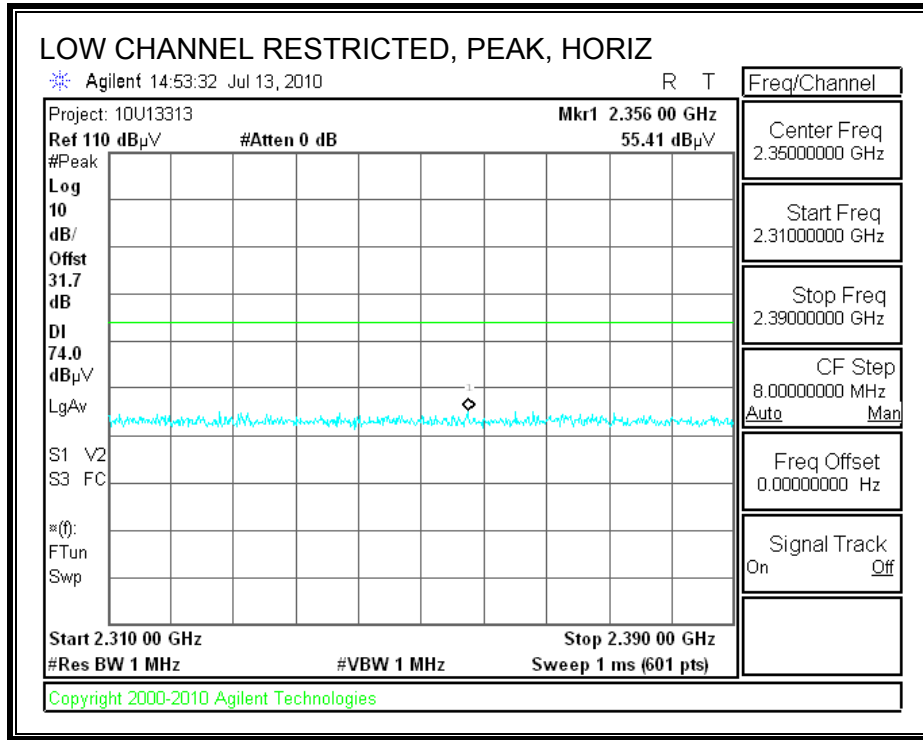
DATA

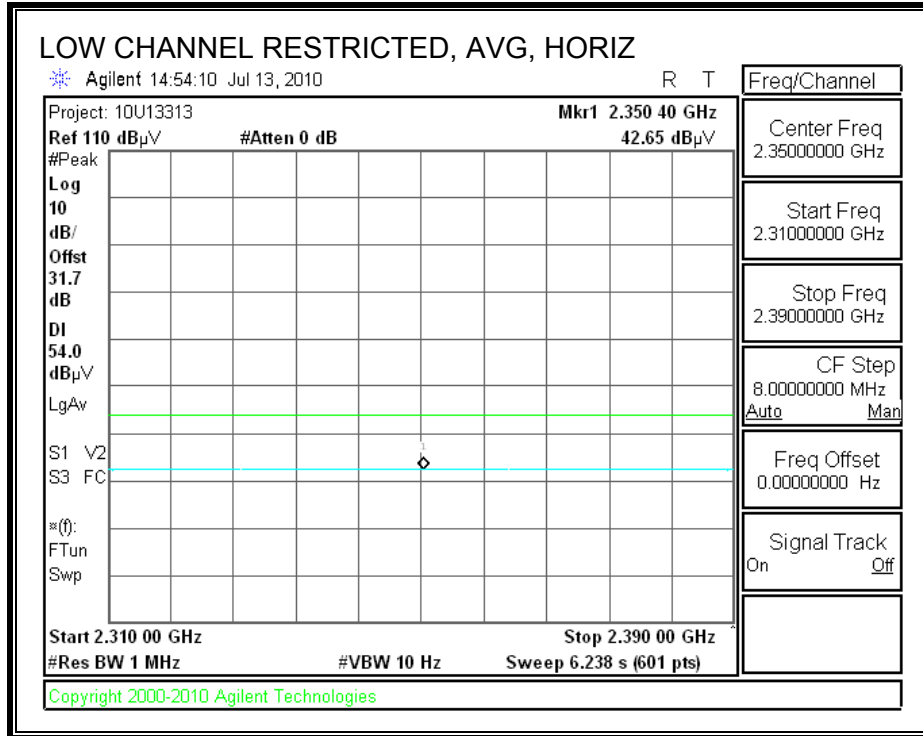
30-1000MHz Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Test Engr:		Thanh Nguyen														
Date:		07/13/10														
Project #:		10U13313														
Company:		Plantronics														
EUT Description:		Wireless Microphone Clip														
EUT M/N:		PA50														
Test Target:		FCC 15.247 Class B														
Mode Oper:		Transmit 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	Filter	Corr.	Limit	Margin	Ant. Pol	Det.	Ant. High	Table Angle	Notes	
MHz	(m)	dBuV	dB/m	dB	dB	dB	dB	dBuV/m	dBuV/m	dB	V/H	P/A/QP	cm	Degree		
Worst Case																
41.880	3.0	48.8	12.7	0.6	28.4	0.0	0.0	33.8	40.0	-6.2	V	P	100.0	0	360	
47.521	3.0	50.4	9.6	0.6	28.4	0.0	0.0	32.3	40.0	-7.7	V	P	100.0	0	360	
436.937	3.0	43.3	15.6	1.9	28.0	0.0	0.0	32.8	46.0	-13.2	V	P	100.0	0	360	
446.657	3.0	42.8	15.8	1.9	28.0	0.0	0.0	32.5	46.0	-13.5	V	P	100.0	0	360	
117.484	3.0	41.7	13.2	1.0	28.3	0.0	0.0	27.6	43.5	-15.9	H	P	100.0	0	360	
127.924	3.0	42.5	13.6	1.1	28.3	0.0	0.0	28.9	43.5	-14.6	H	P	100.0	0	360	
213.128	3.0	48.4	11.9	1.3	28.2	0.0	0.0	33.4	43.5	-10.1	H	P	100.0	0	360	
224.048	3.0	46.5	11.9	1.3	28.2	0.0	0.0	31.5	46.0	-14.5	H	P	100.0	0	360	
387.975	3.0	43.8	14.7	1.8	28.1	0.0	0.0	32.2	46.0	-13.8	H	P	100.0	0	360	
445.697	3.0	42.5	15.7	1.9	28.0	0.0	0.0	32.2	46.0	-13.8	H	P	100.0	0	360	
Rev. 1.27.09																
Note: No other emissions were detected above the system noise floor.																

8.3. TX SPURIOUS EMISSIONS ABOVE 1 GHz

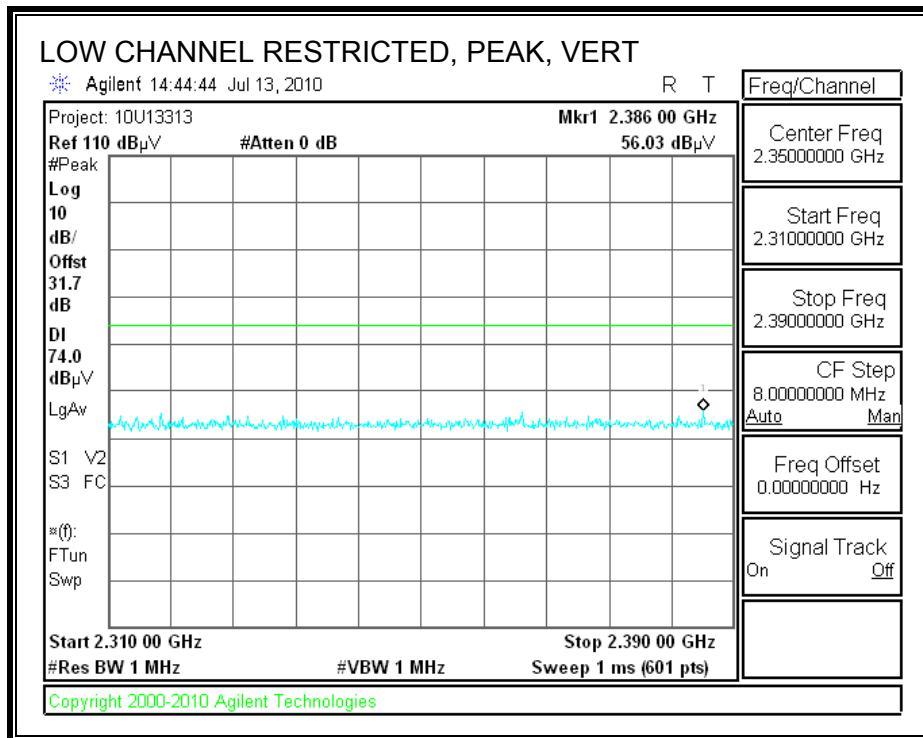
8.3.1. BASIC DATA RATE GFSK MODULATION

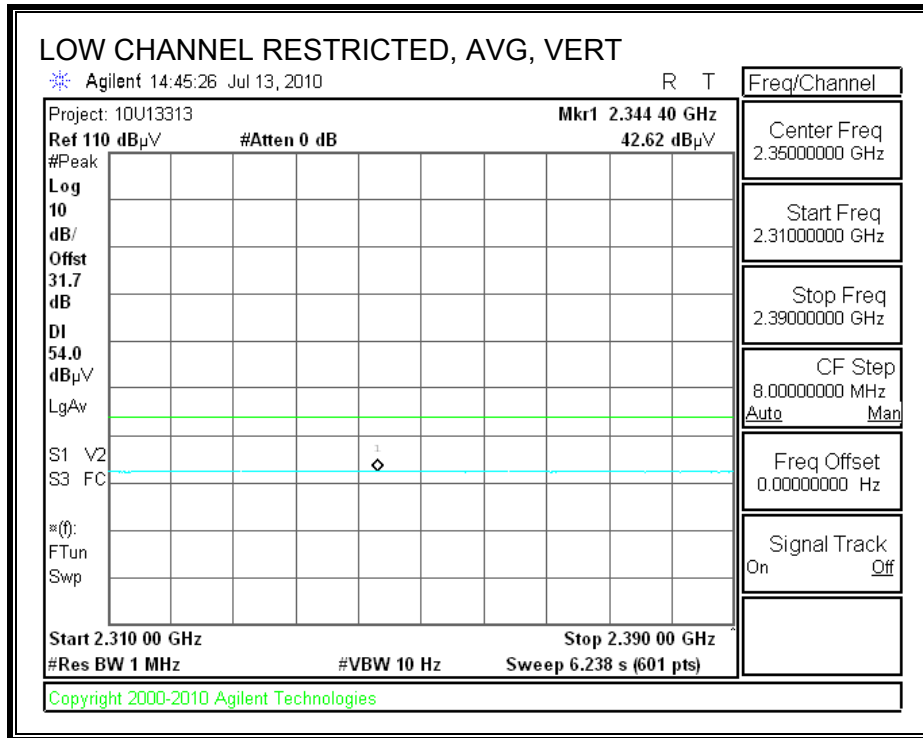
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



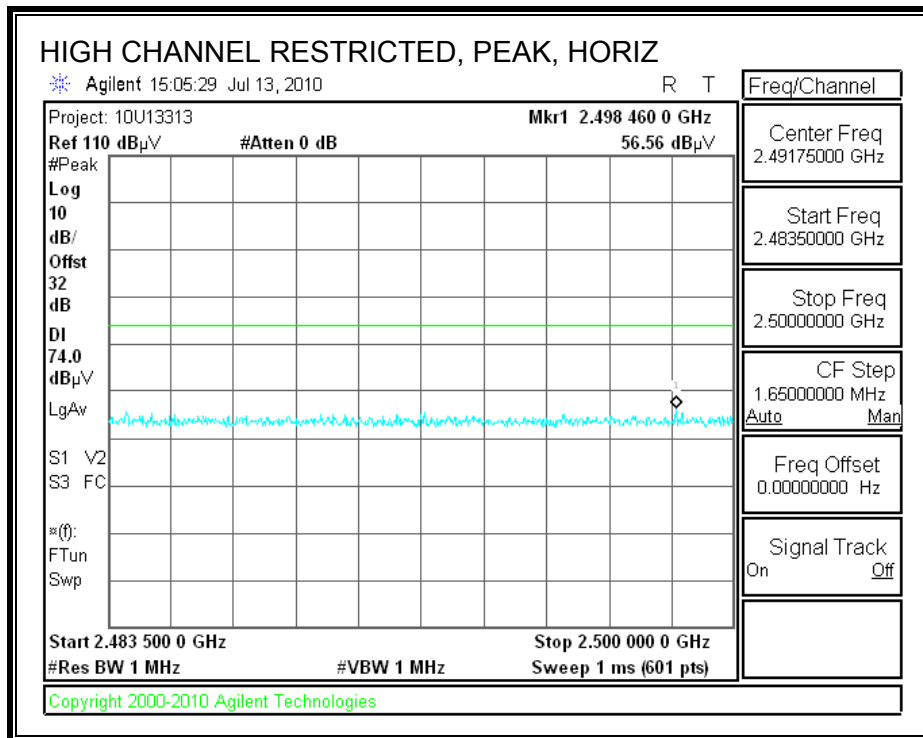


RESTRICTED BANDEGE (LOW CHANNEL, VERTICAL)

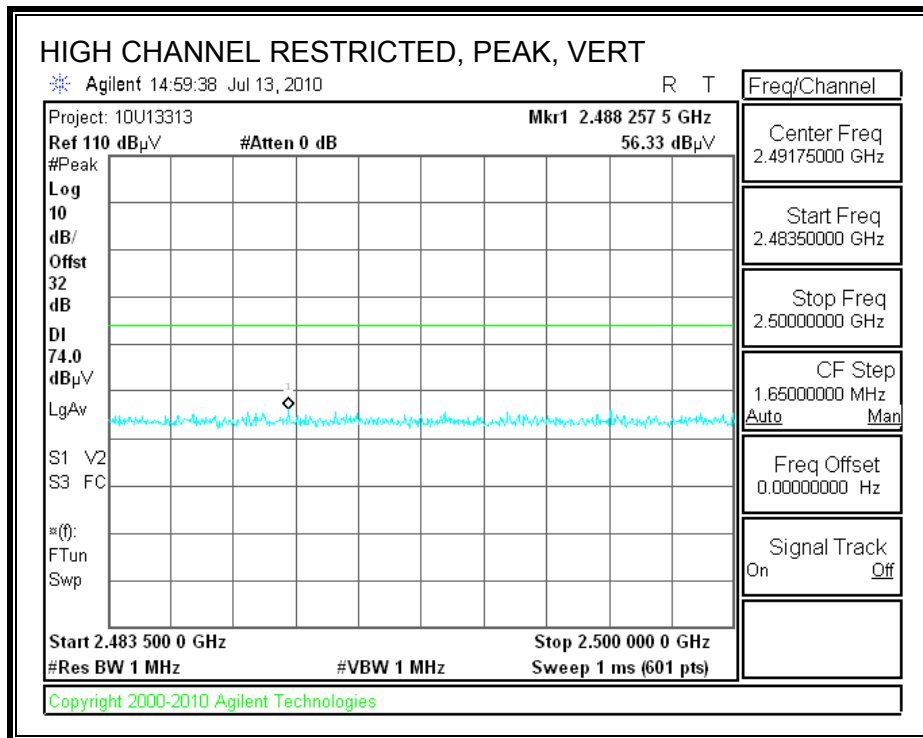


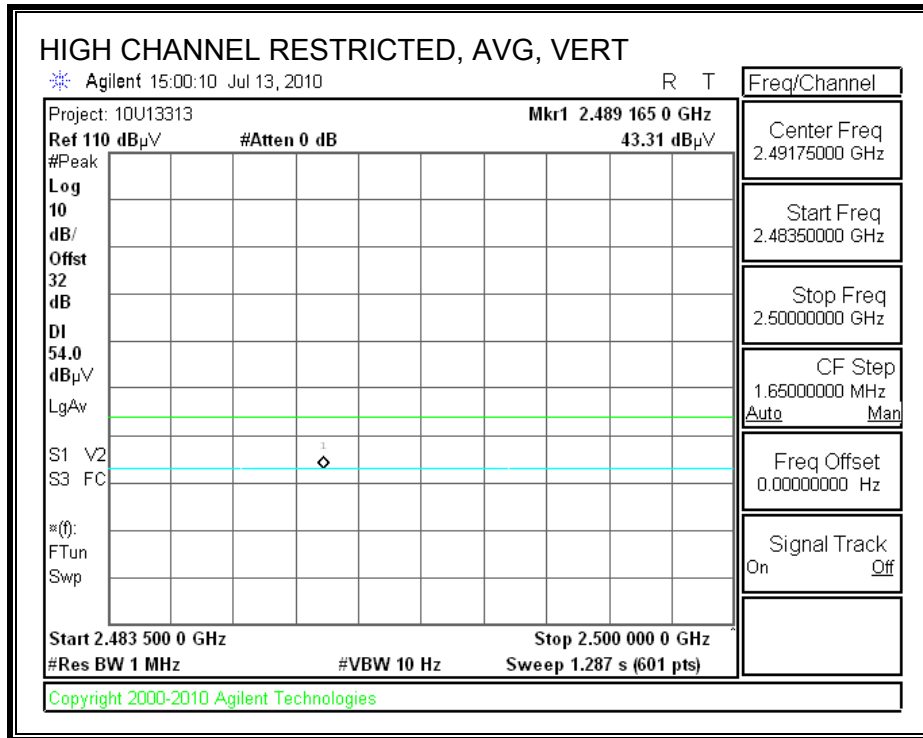


RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



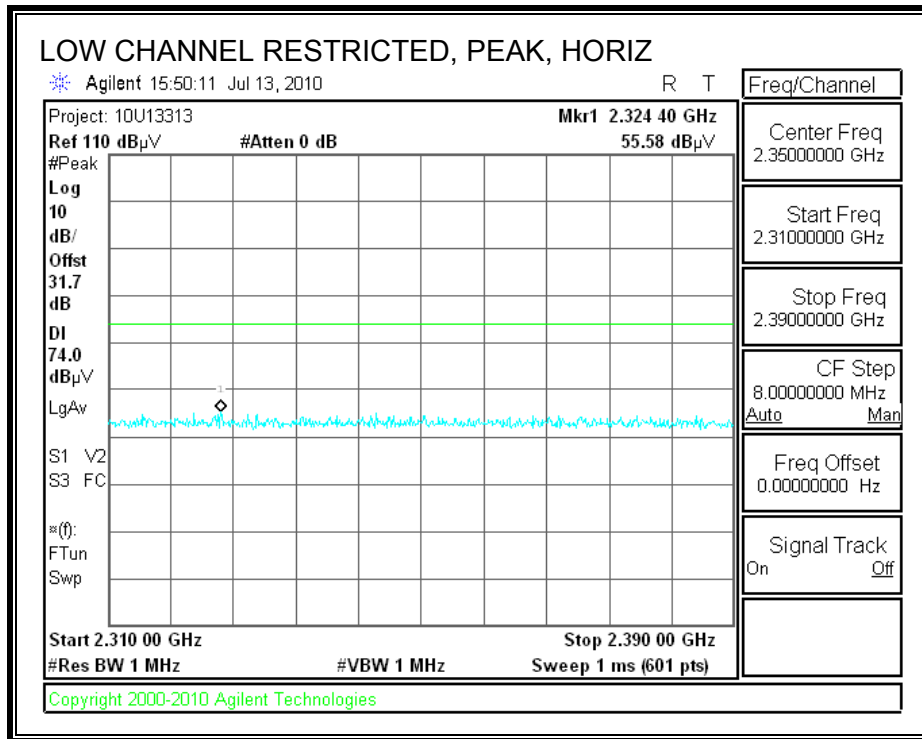


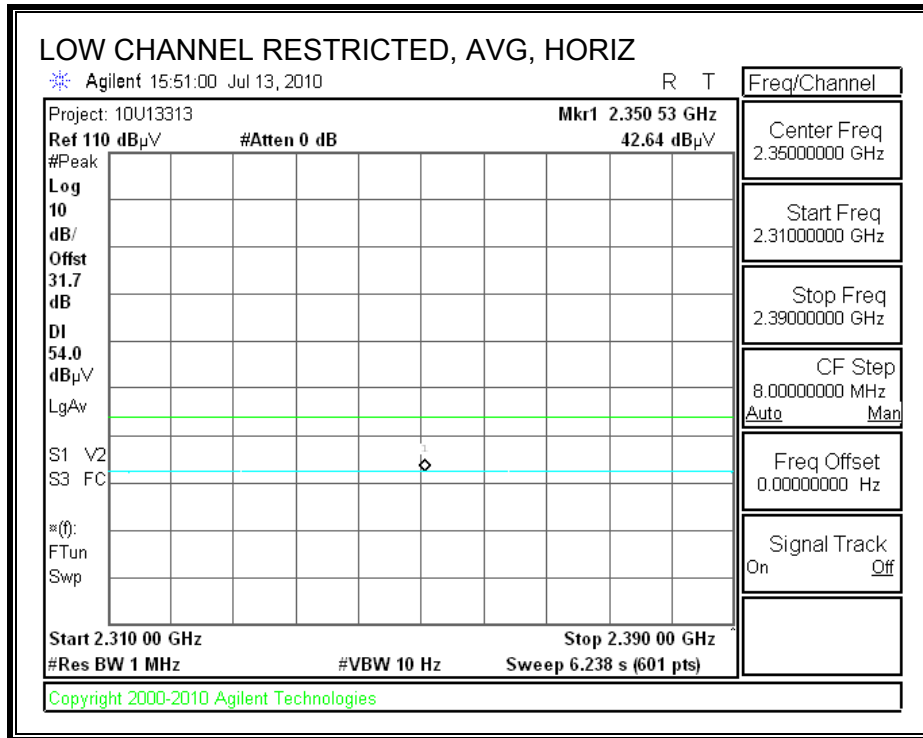
HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company:		Plantronics															
Project #:		10U13313															
Date:		7/13/2010															
Test Engineer:		Thanh Nguyen															
Configuration:		EUT worst position															
Mode:		Transmit Basic rate GFSK															
Test Equipment:																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T73; S/N: 6717 @3m			T144 Miteq 3008A00931									FCC 15.209					
Hi Frequency Cables																	
3' cable 22807700			12' cable 22807600			20' cable 22807500			HPF			Reject Filter			Peak Measurements		
3' cable 22807700			12' cable 22807600			20' cable 22807500						R_001			RBW=VBW=1MHz		
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)		
Low Ch																	
4.804	3.0	52.3	34.5	33.0	5.8	-36.5	0.0	0.0	54.6	36.8	74	54	-19.4	-17.2	V		
7.206	3.0	38.6	27.4	35.1	7.2	-36.2	0.0	0.0	44.7	33.5	74	54	-29.3	-20.5	Noise Floor		
4.804	3.0	48.3	32.1	33.0	5.8	-36.5	0.0	0.0	50.6	34.4	74	54	-23.4	-19.6	V		
7.206	3.0	38.1	27.4	35.1	7.2	-36.2	0.0	0.0	44.2	33.5	74	54	-29.8	-20.5	Noise Floor		
Mid Ch																	
4.882	3.0	53.3	33.3	33.1	5.8	-36.5	0.0	0.0	55.7	35.7	74	54	-18.3	-18.3	V		
7.323	3.0	37.3	26.0	35.3	7.3	-36.2	0.0	0.0	43.6	32.3	74	54	-30.4	-21.7	Noise Floor		
4.882	3.0	49.4	32.2	33.1	5.8	-36.5	0.0	0.0	51.8	34.6	74	54	-22.2	-19.4	H		
7.323	3.0	38.3	25.6	35.3	7.3	-36.2	0.0	0.0	44.6	31.9	74	54	-29.4	-22.1	Noise Floor		
High Ch																	
4.960	3.0	54.3	37.4	33.2	5.9	-36.5	0.0	0.0	56.9	40.0	74	54	-17.1	-14.0	V		
7.440	3.0	38.7	27.2	35.5	7.3	-36.2	0.0	0.0	45.3	33.8	74	54	-28.7	-20.2	Noise Floor		
4.960	3.0	52.2	35.5	33.2	5.9	-36.5	0.0	0.0	54.8	38.1	74	54	-19.2	-15.9	H		
7.440	3.0	37.2	27.0	35.5	7.3	-36.2	0.0	0.0	43.8	33.6	74	54	-30.2	-20.4	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										

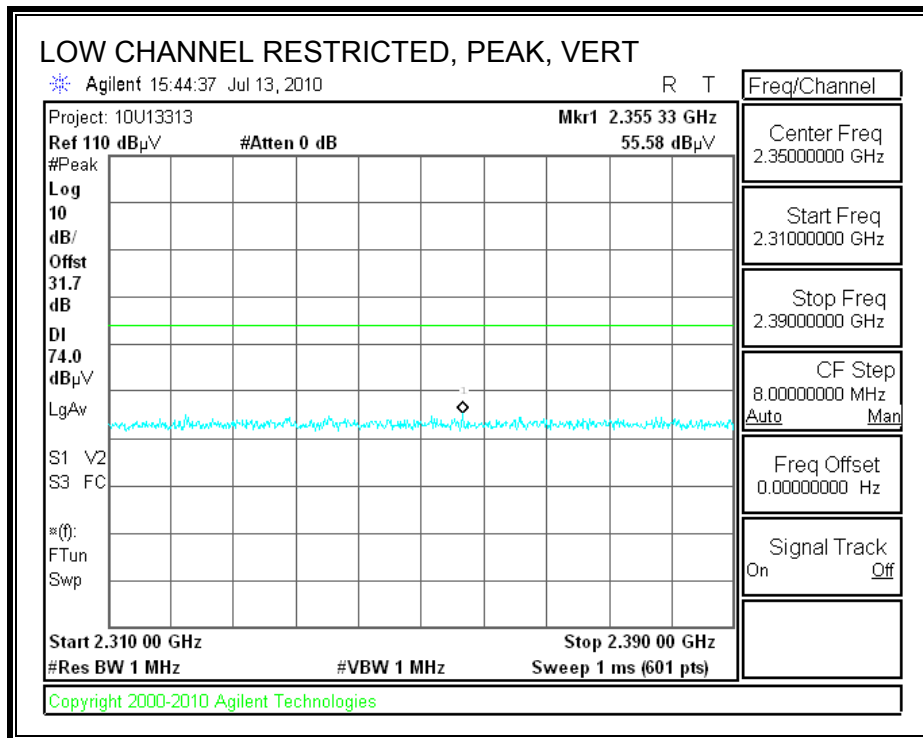
8.3.2. ENHANCED DATA RATE 8PSK MODULATION

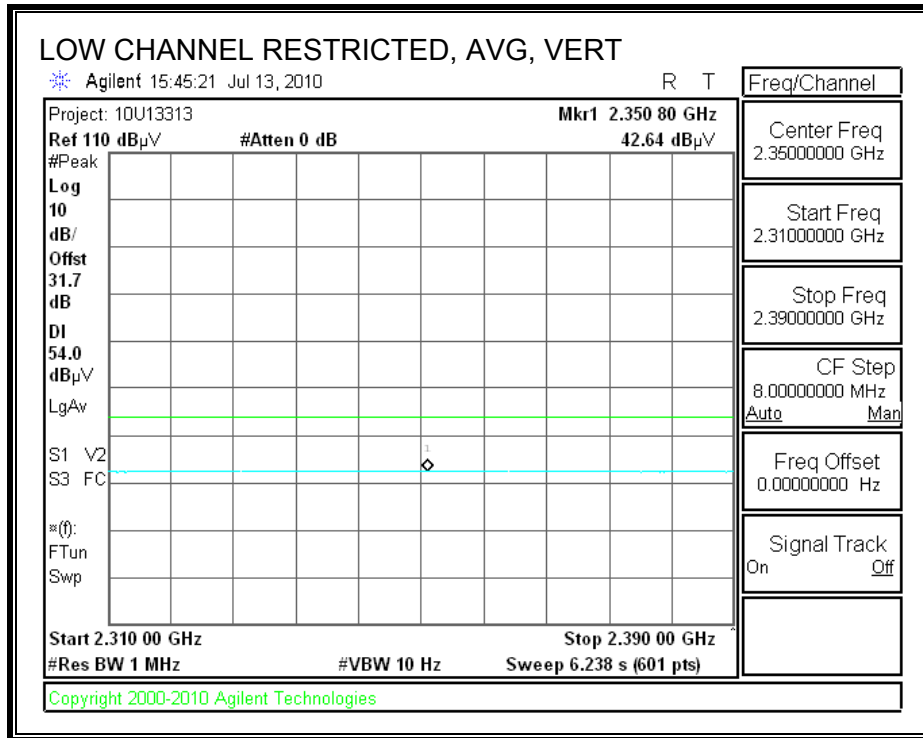
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



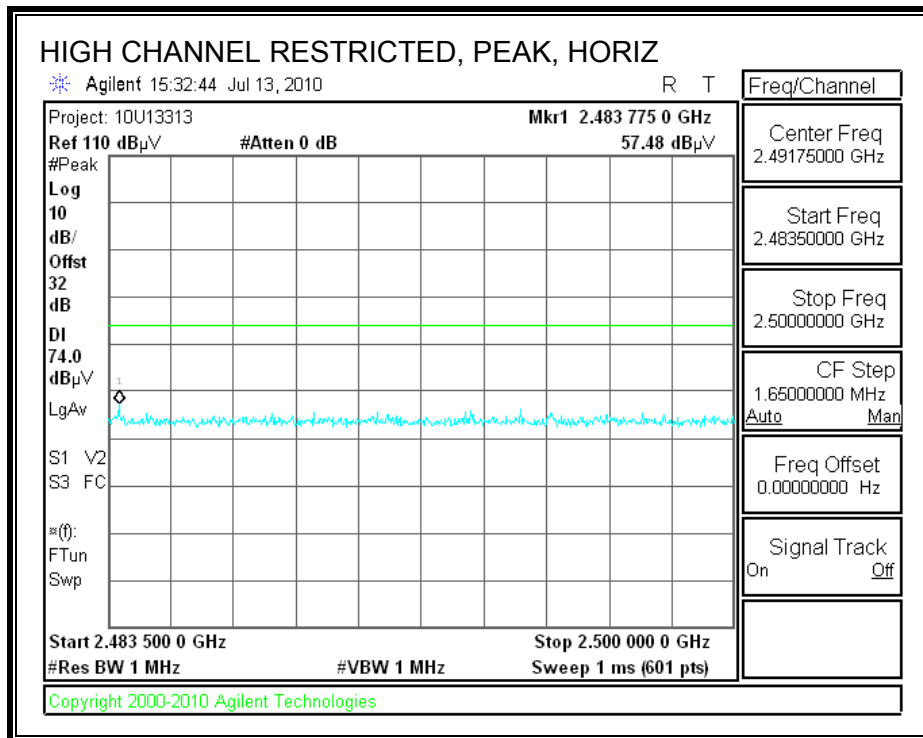


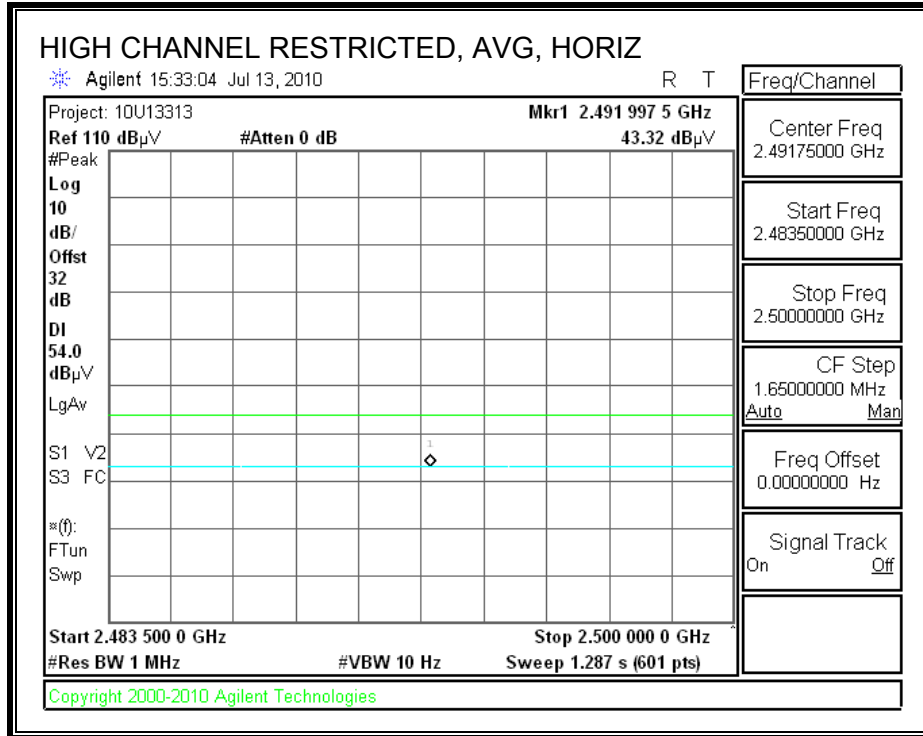
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



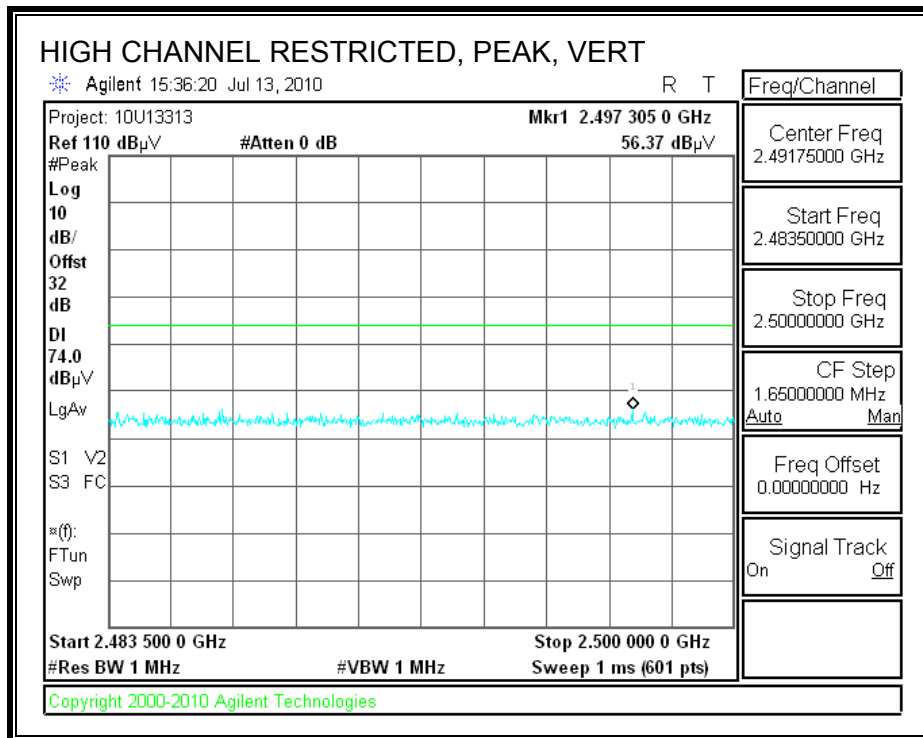


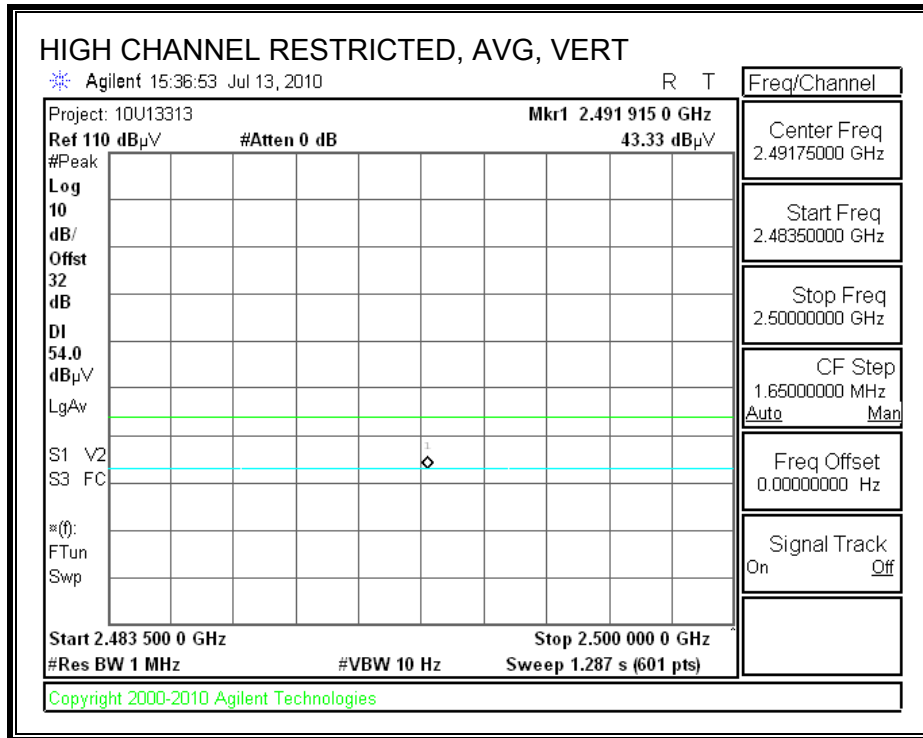
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company:		Plantronics															
Project #:		10U13313															
Date:		7/13/2010															
Test Engineer:		Thanh Nguyen															
Configuration:		EUT worst position															
Mode:		Transmit EDR rate 8PSK															
Test Equipment:																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T73; S/N: 6717 @3m			T144 Miteq 3008A00931									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	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)		
Low Ch																	
4.804	3.0	49.3	31.4	33.0	5.8	-36.5	0.0	0.0	51.7	33.7	74	54	-22.3	-20.3	V		
7.206	3.0	38.2	27.3	35.1	7.2	-36.2	0.0	0.0	44.3	33.5	74	54	-29.7	-20.5	Noise Floor		
4.804	3.0	45.2	29.4	33.0	5.8	-36.5	0.0	0.0	47.6	31.7	74	54	-26.4	-22.3	V		
7.206	3.0	38.0	27.3	35.1	7.2	-36.2	0.0	0.0	44.1	33.4	74	54	-29.9	-20.6	Noise Floor		
Mid Ch																	
4.882	3.0	49.4	30.2	33.1	5.8	-36.5	0.0	0.0	51.9	32.7	74	54	-22.1	-21.3	V		
7.323	3.0	37.8	25.3	35.3	7.3	-36.2	0.0	0.0	44.2	31.7	74	54	-29.8	-22.3	Noise Floor		
4.882	3.0	46.7	30.6	33.1	5.8	-36.5	0.0	0.0	49.1	33.0	74	54	-24.9	-21.0	H		
7.323	3.0	38.7	25.3	35.3	7.3	-36.2	0.0	0.0	45.0	31.7	74	54	-29.0	-22.3	Noise Floor		
High Ch																	
4.960	3.0	51.9	33.3	33.2	5.9	-36.5	0.0	0.0	54.5	35.9	74	54	-19.5	-18.1	V		
7.440	3.0	38.8	26.6	35.5	7.3	-36.2	0.0	0.0	45.4	33.2	74	54	-28.6	-20.8	Noise Floor		
4.960	3.0	49.2	32.2	33.2	5.9	-36.5	0.0	0.0	51.8	34.8	74	54	-22.2	-19.2	H		
7.440	3.0	37.5	26.8	35.5	7.3	-36.2	0.0	0.0	44.1	33.4	74	54	-29.9	-20.6	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. RECEIVER ABOVE 1 GHz

High Frequency Measurement
 Compliance Certification Services, Fremont 5m Chamber

Company: Plantronics
 Project #: 10U13313
 Date: 7/13/2010
 Test Engineer: Thanh Nguyen
 Configuration: EUT worst position
 Mode: Receive

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			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		R_001	Average Measurements RBW=1MHz; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.630	3.0	51.6	45.2	26.0	3.1	-38.6	0.0	0.0	42.0	35.7	74	54	-32.0	-18.3	V
5.520	3.0	39.6	24.7	34.0	6.3	-36.4	0.0	0.0	43.5	28.5	74	54	-30.5	-25.5	Noise Floor
1.630	3.0	48.3	44.9	26.0	3.1	-38.6	0.0	0.0	38.7	35.4	74	54	-35.3	-18.6	H

No other emissions were detected above 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		

9. 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 ²)	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 ²)	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 ²)	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 ²)	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 ²)	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> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<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> ^{1.2}
150 000–300 000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616 000 / <i>f</i> ^{1.2}

* 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/m² is equivalent to 1 mW/cm².
 3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

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

where

S = Power density in W/m²
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m² is converted to units of mW/cm² 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/m²

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

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

where

Px = Power of transmitter x
Gx = Numeric gain of antenna x

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

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm²

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m²

RESULTS

(MPE distance equals 20 cm)

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m ²)	FCC Power Density (mW/cm ²)
2.4 GHz	Bluetooth	0.20	7.11	1.50	0.01	0.001