



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

**FOR
BLUETOOTH TRANSCEIVER MODULE**

MODEL NUMBER: BCM92046MD_MINI

FCC ID: QDS-BRCM1037

IC: 4324A-BRCM1037

REPORT NUMBER: 08U11678-1A

ISSUE DATE: APRIL 10, 2008

Prepared for

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

Prepared by

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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>
--	4-1-08	Initial Issue	Sunny Shih
A	4-1-08	Replaced correct plot on page 49	Sunny Shih

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Bluetooth Transceiver Module

MODEL: BCM92046MD_MINI

DATE TESTED: March 26 – April 02, 2008

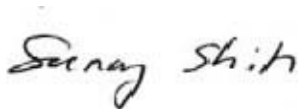
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	No Non-Compliance Noted
RSS-210 Issue 7 Annex 8 and RSS-GEN Issue 2	No Non-Compliance Noted

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



SUNNY SHIH
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

VIEN TRAN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

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

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

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 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.

The radio module is manufactured by Universal Scientific Industrial (Shanghai) 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) (dBm)	Output Power (mW)
2402 - 2480	Basic GFSK	2.49	1.77
2402 - 2480	Enhanced 8PSK	4.23	2.65

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an IFA antenna, with a maximum gain of -1.71 dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was Broadcom, rev.5.1.0.1400.

The test utility software used during testing was Broadcom Blue Tool, rev. 1.0.0.6

5.5. WORST-CASE CONFIGURATION AND MODE

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

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	HP	Pavillion DV6000	CNF6463KP7	DoC
AC Adapter	HP	PPP009H	F3-0411078705D	N/A
Adapter Board	Broadcom	BCM9USB3P3V	110-112577-	N/A
Adapter Board	Broadcom	M-9 94V-0	809	N/A

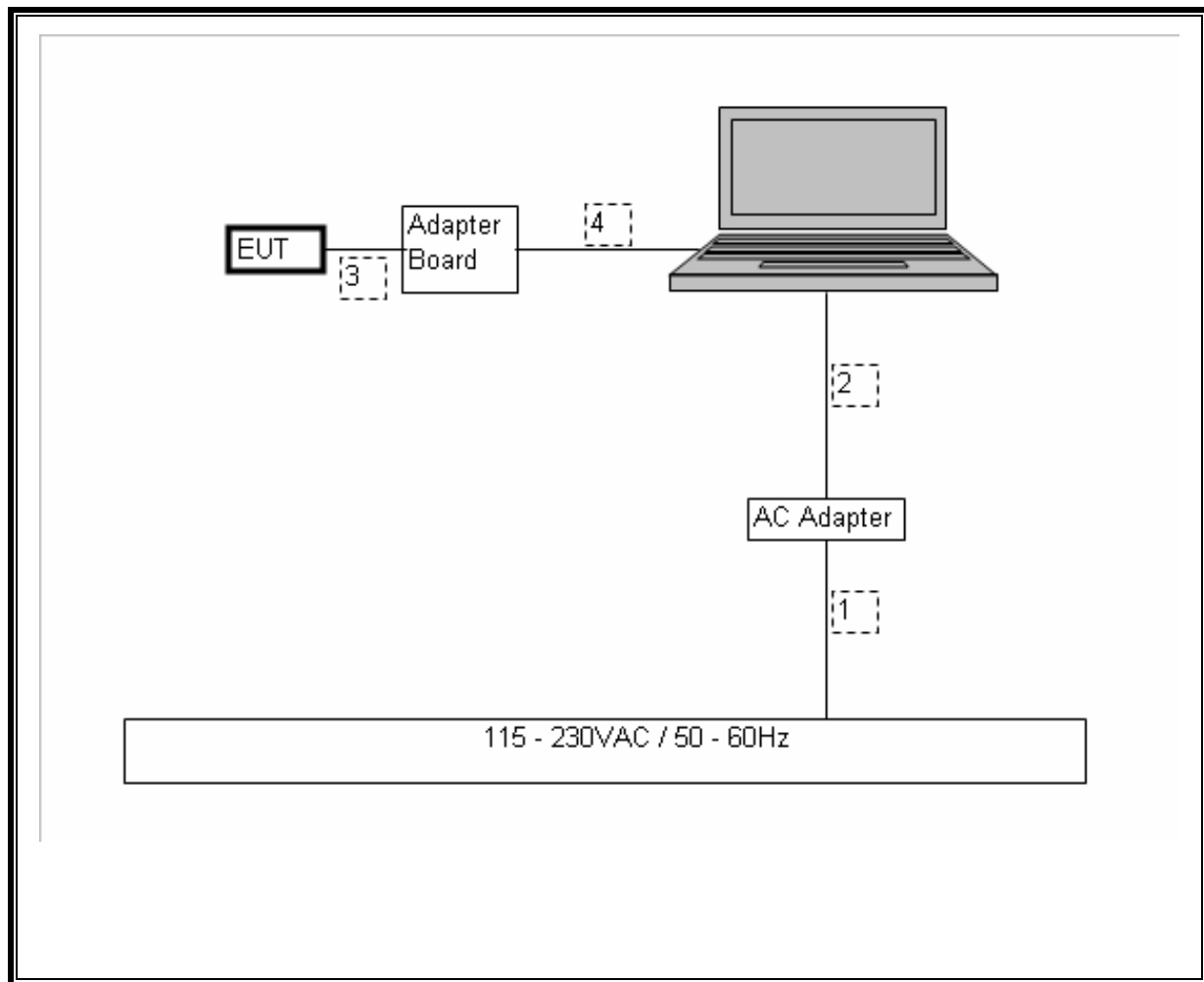
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US115V	Unshielded	1.8m	N/A
2	DC	1	DC	Unshielded	1.8m	N/A
3	Ribbon Cable	1	Ribbon Cable	Unshielded	.15m	EUT / Adapter Board
4	USB	1	USB	Shielded	2m	Adapter Board / Laptop

TEST SETUP

The EUT is connected to a host laptop computer via an adapter board 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, Horn, 18 GHz	ETS	3117	C01005	04/15/07	04/15/08
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/15/07	04/15/08
Bilog Antenna	Sunol Sciences	JB1	C01016	10/13/07	10/13/08
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	08/03/07	09/27/08
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/03/06	09/27/08
Preamplifier, 1300 MHz	Agilent / HP	8447D	C01064	05/09/07	05/09/08
RF Filter Section, 2.9 GHz	Agilent / HP	85420E	C00958	02/06/07	06/12/08
Peak Power Meter	Agilent / HP	E4416A	C00963	02/14/07	12/02/08
Peak / Average Power Sensor	Agilent	E9327A	C00964	02/14/07	12/02/08
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	10/16/07	01/27/09
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	09/15/06	09/15/08
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	09/15/06	09/15/08
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	05/02/06	08/07/08

7. ANTENNA PORT TEST RESULTS

7.1.1. 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.

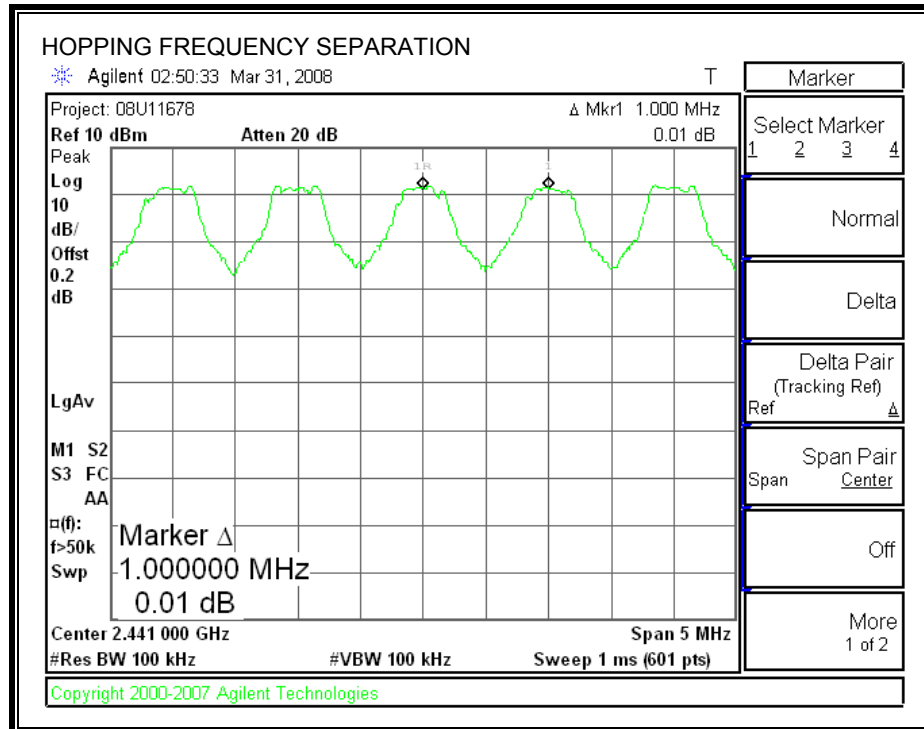
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

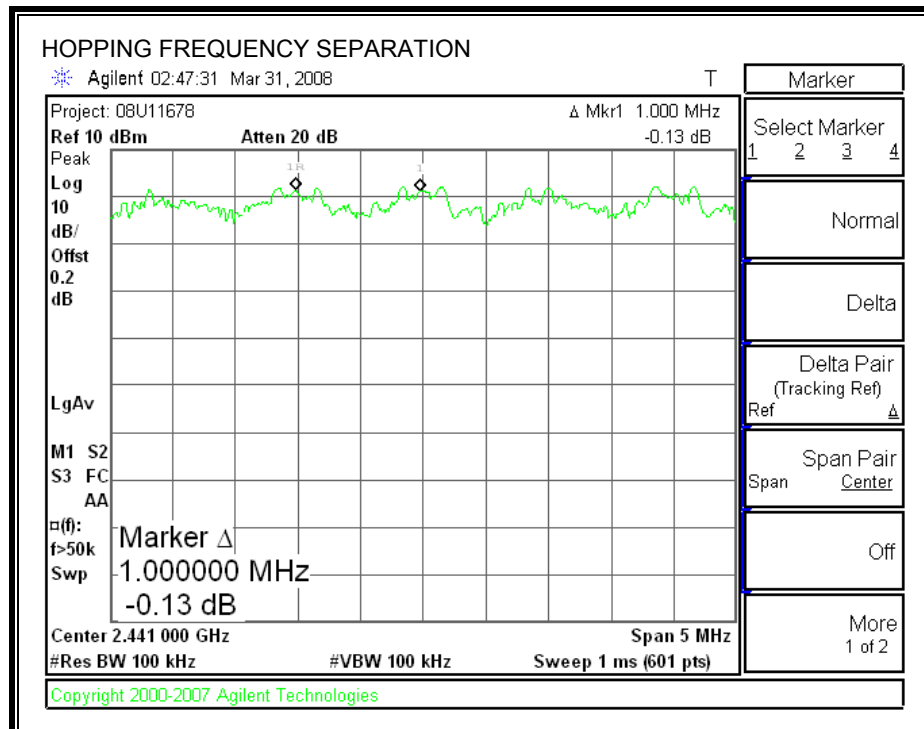
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION – GFSK MODE



HOPPING FREQUENCY SEPARATION – 8PSK MODE



7.1.2. 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.

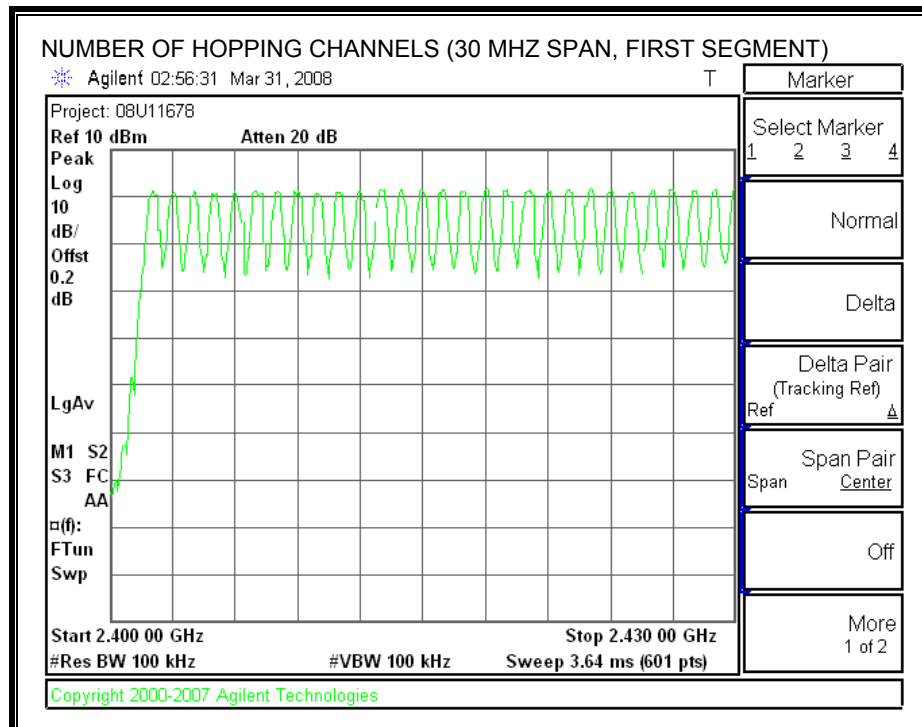
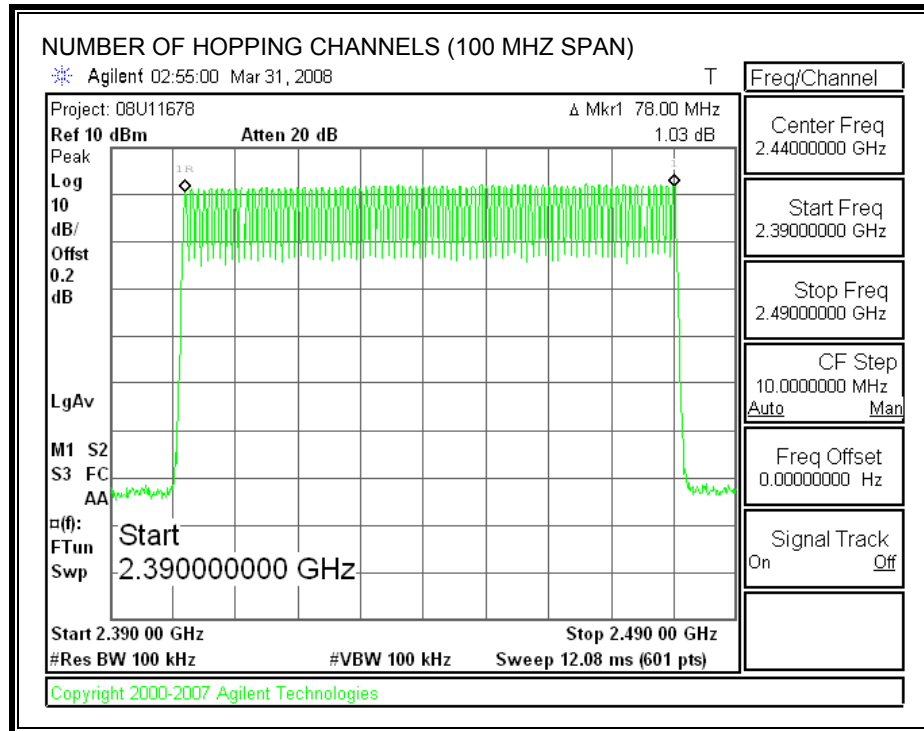
TEST PROCEDURE

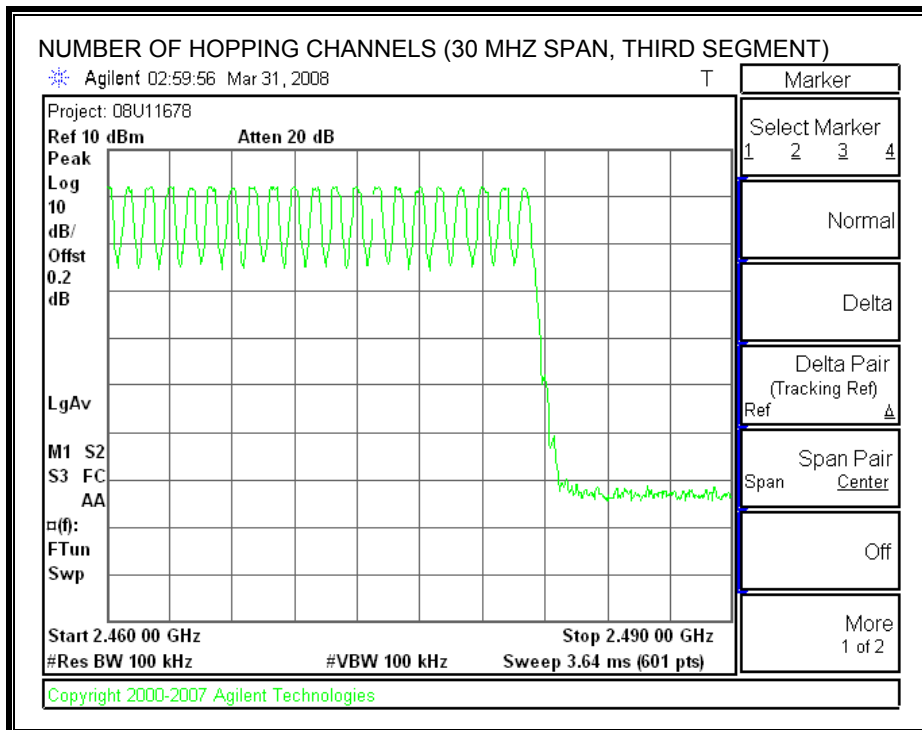
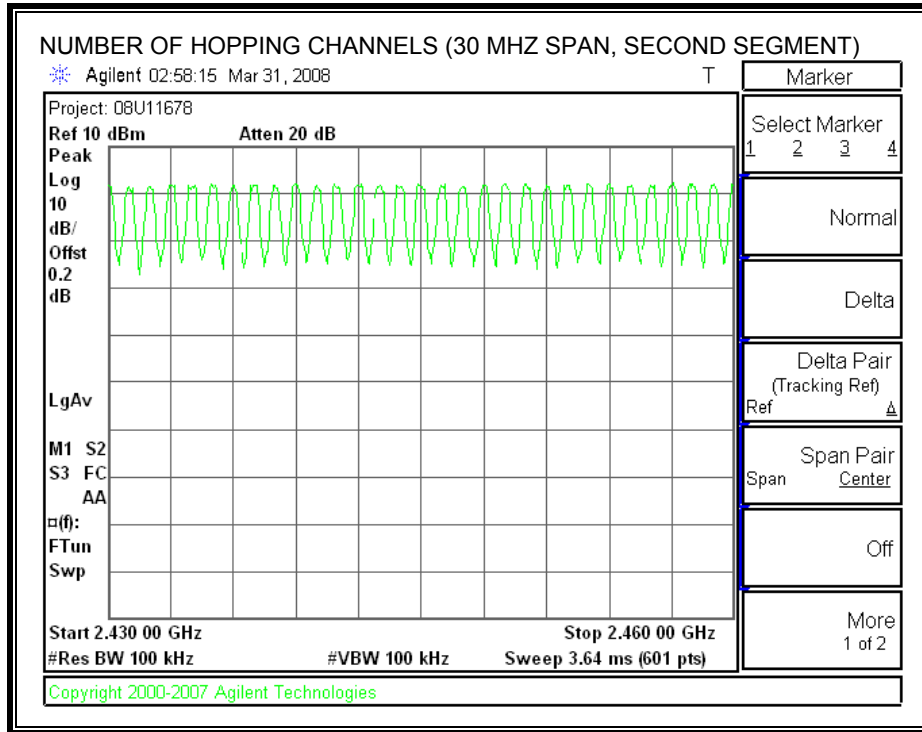
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

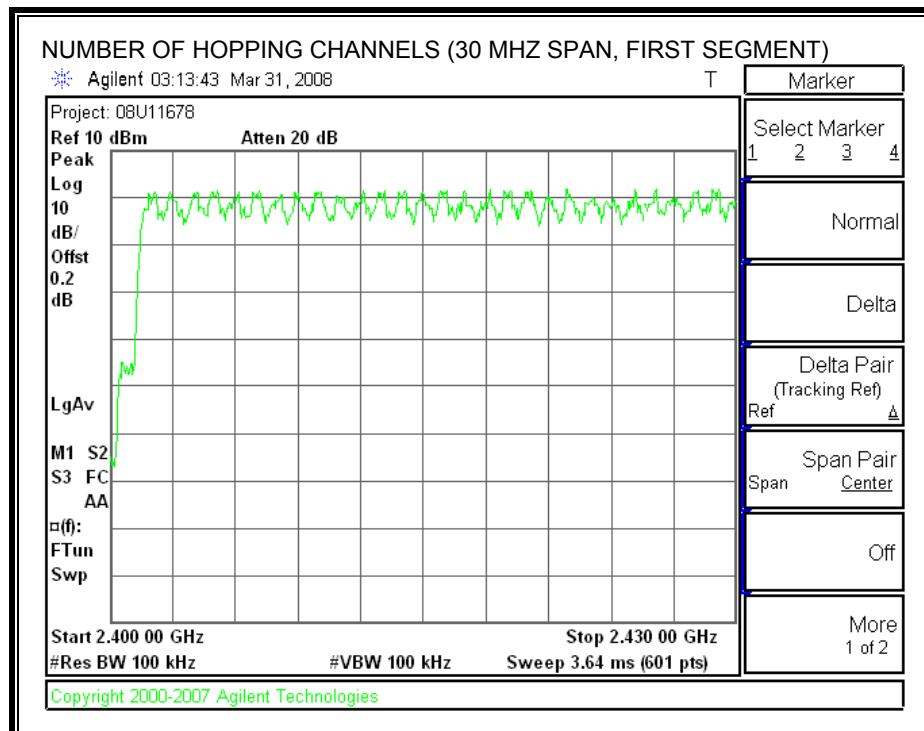
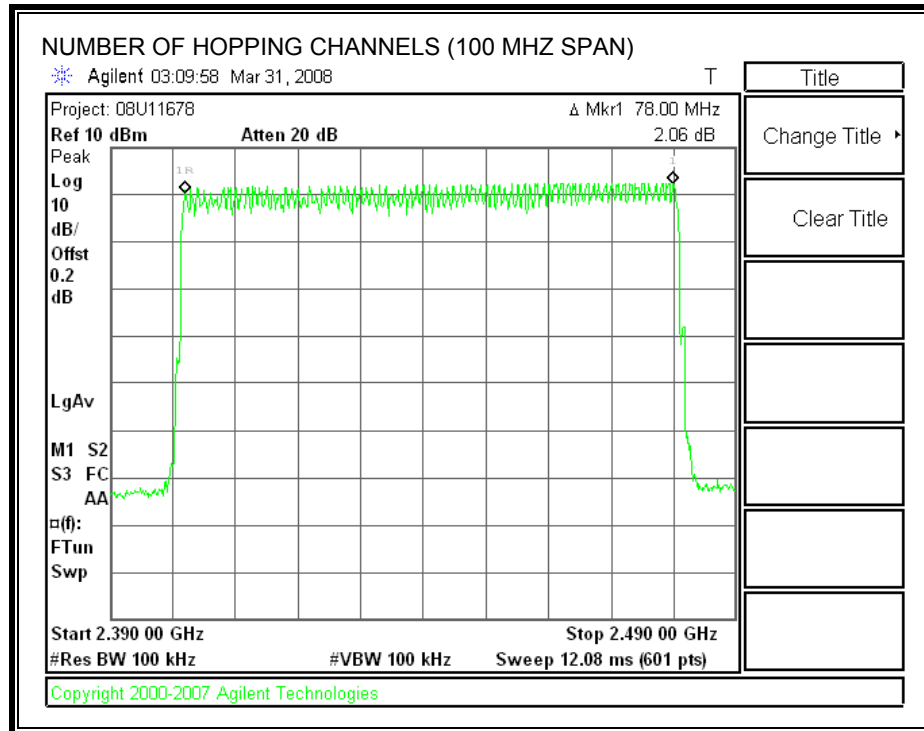
79 Channels observed.

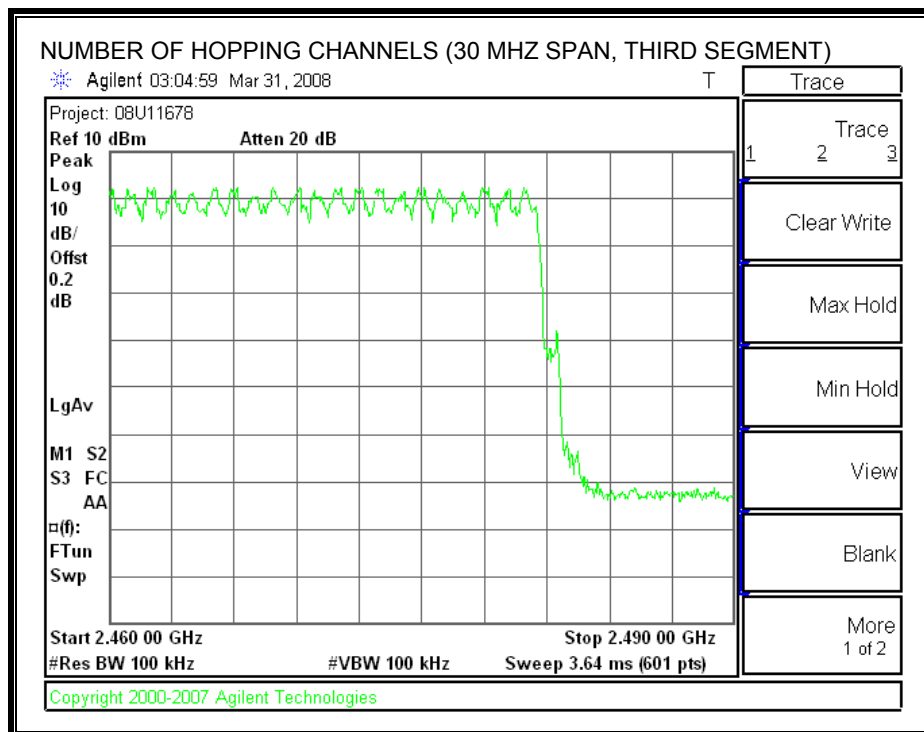
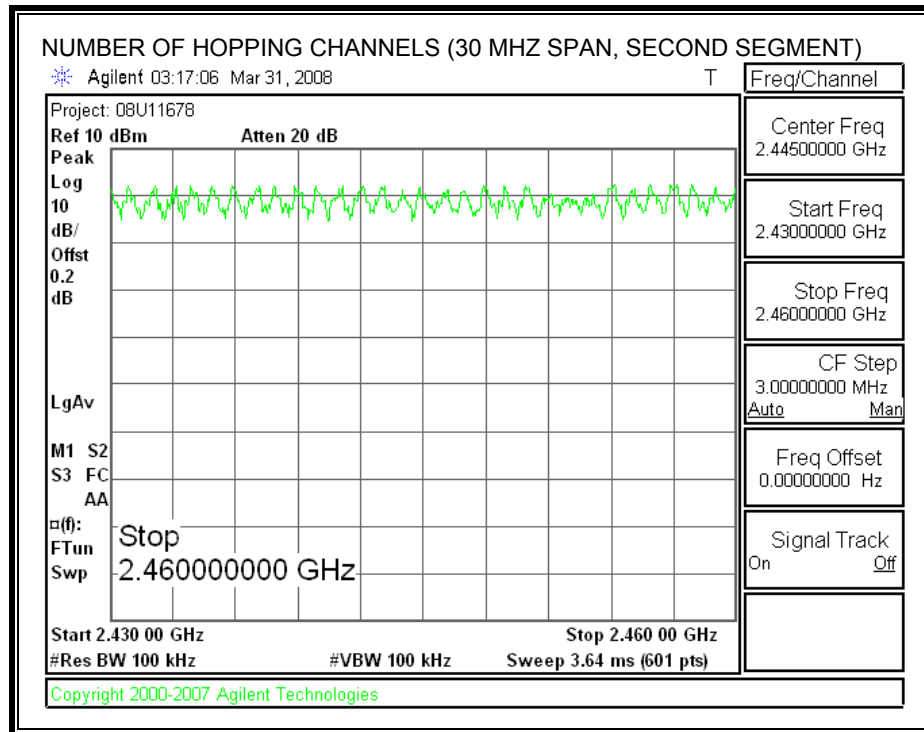
NUMBER OF HOPPING CHANNELS – GFSK MODE





NUMBER OF HOPPING CHANNELS – 8PSK MODE





7.1.3. 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

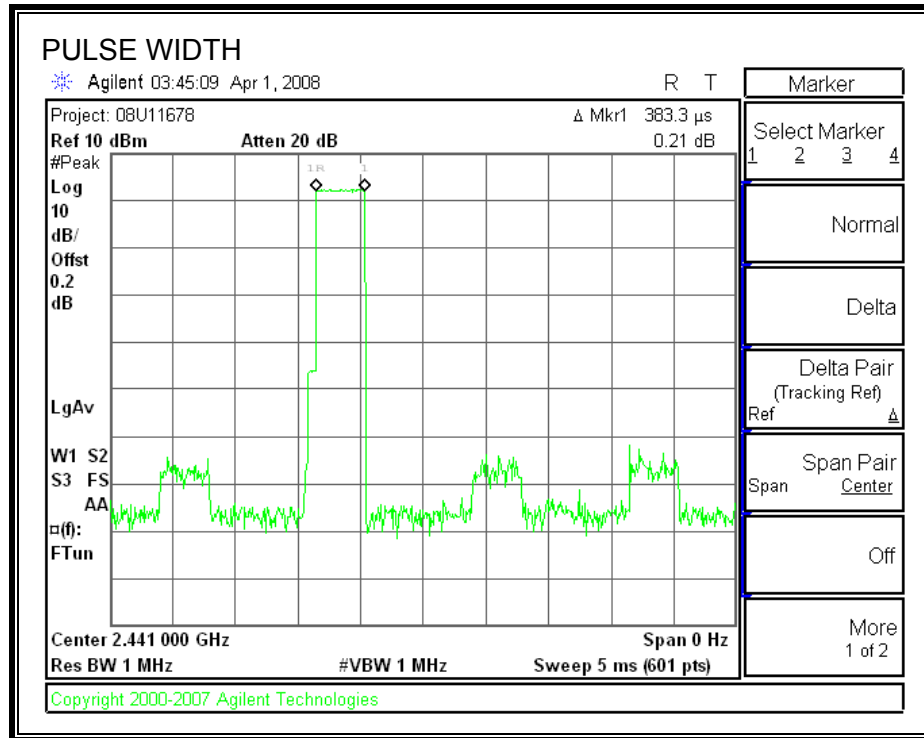
GFSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.383	30	0.115	0.4	0.285
DH3	1.617	16	0.259	0.4	0.141
DH5	2.883	12	0.346	0.4	0.054

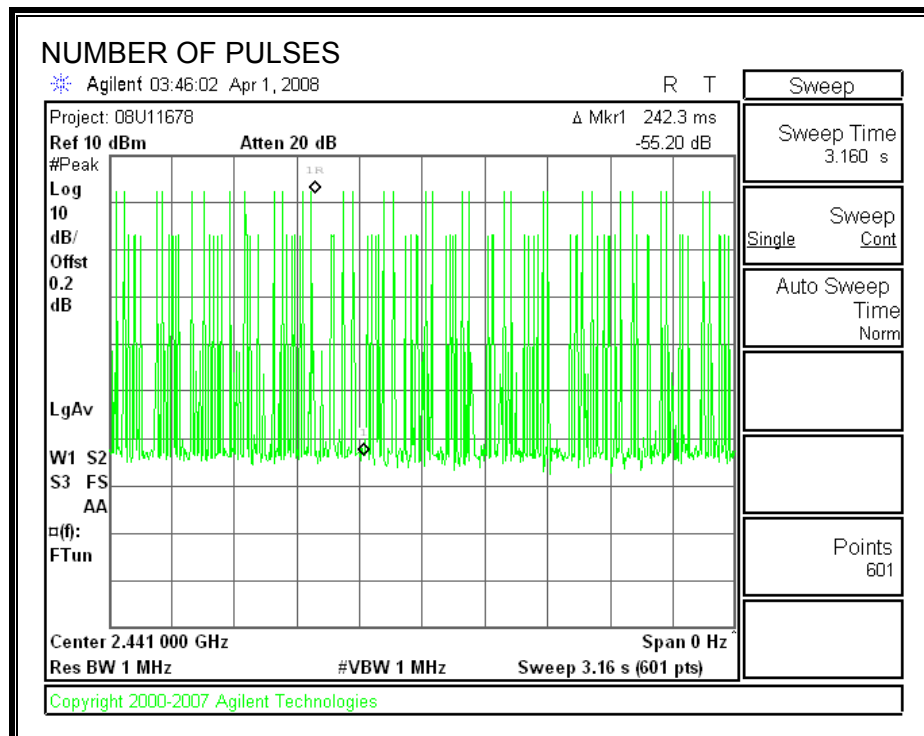
8PSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.275	32	0.088	0.4	0.312
DH3	0.65	15	0.098	0.4	0.303
DH5	1.067	12	0.128	0.4	0.272

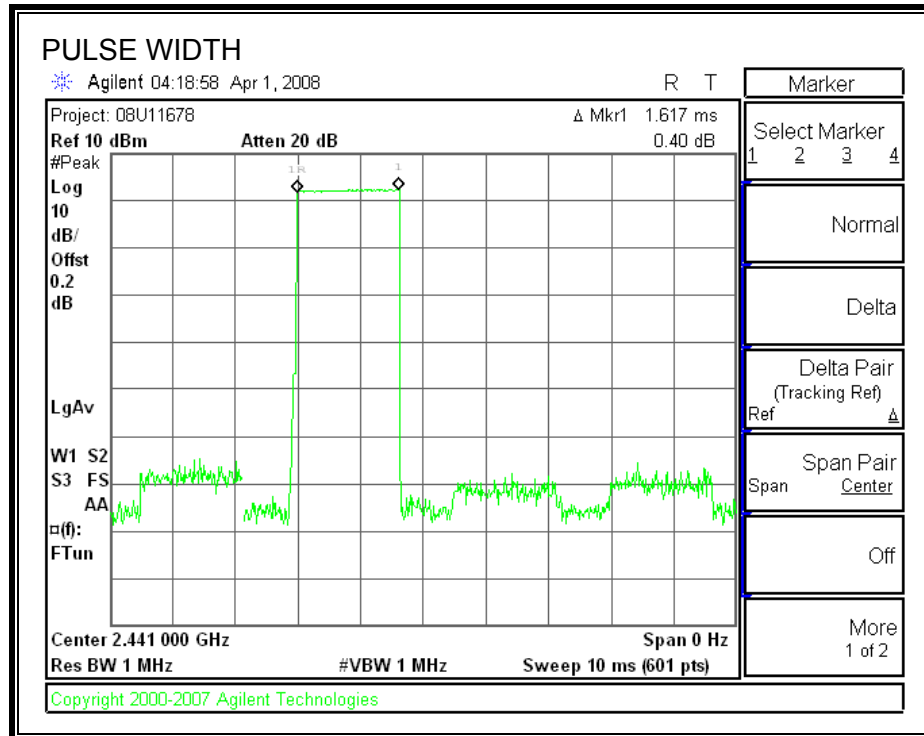
GFSK MODE - FREQUENCY PACKET DH1



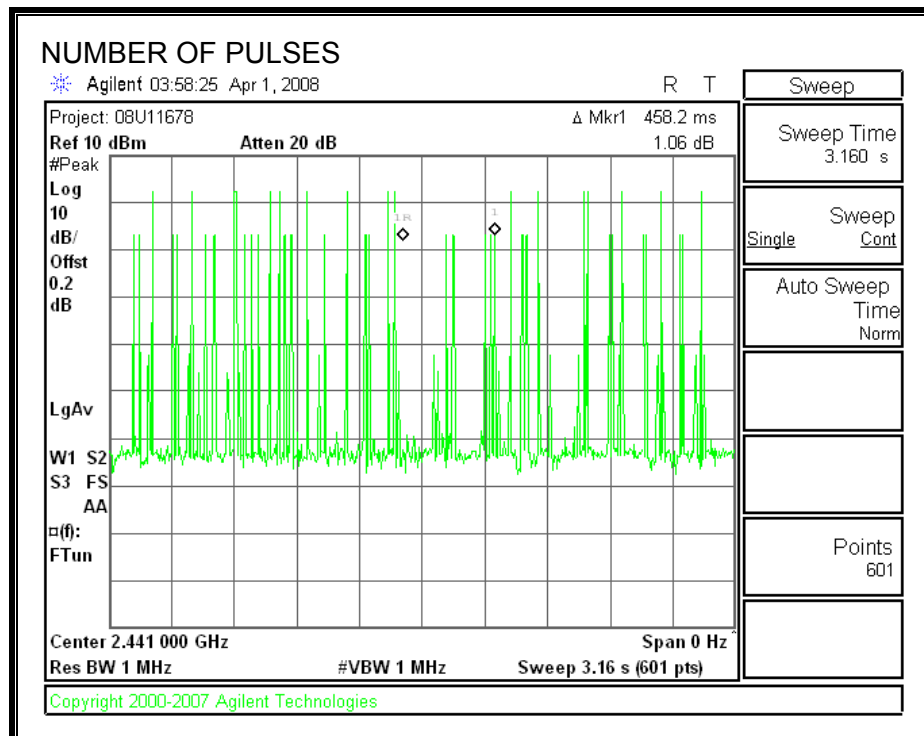
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



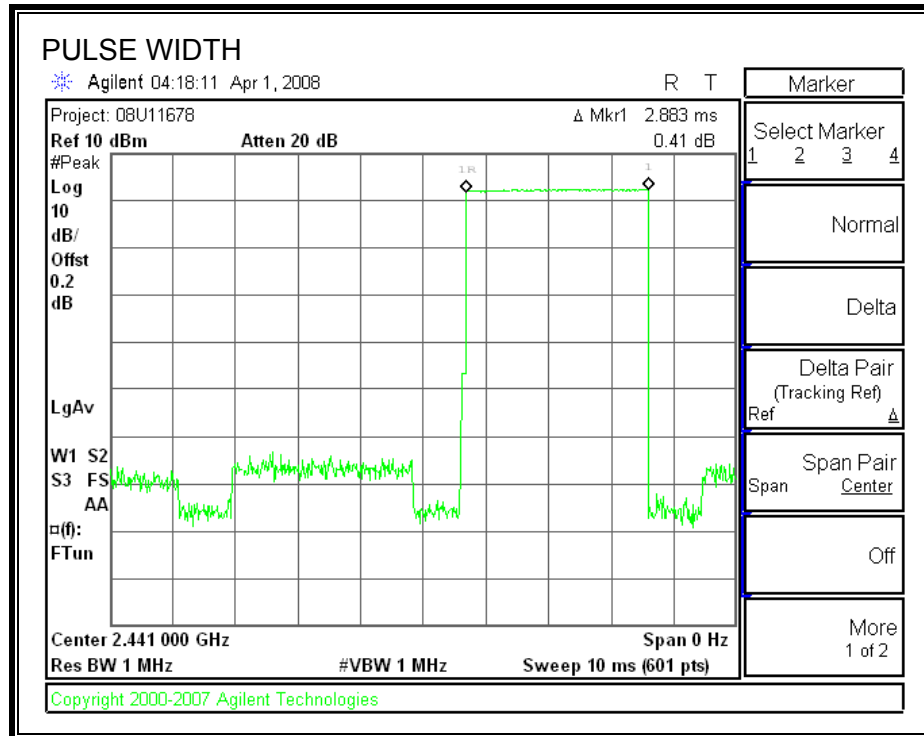
FREQUENCY PACKET DH3



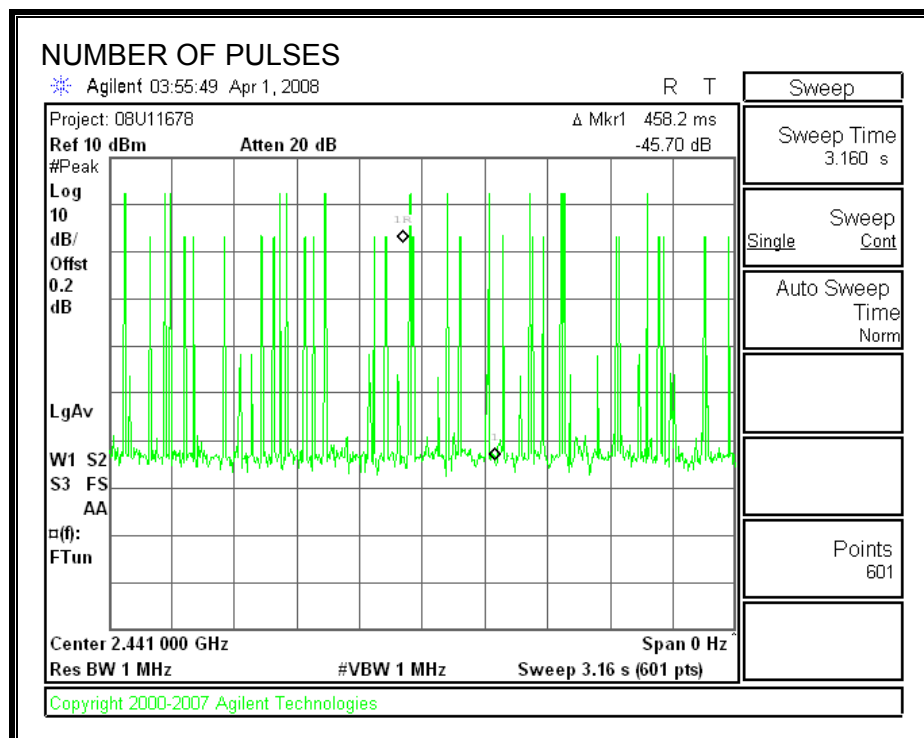
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



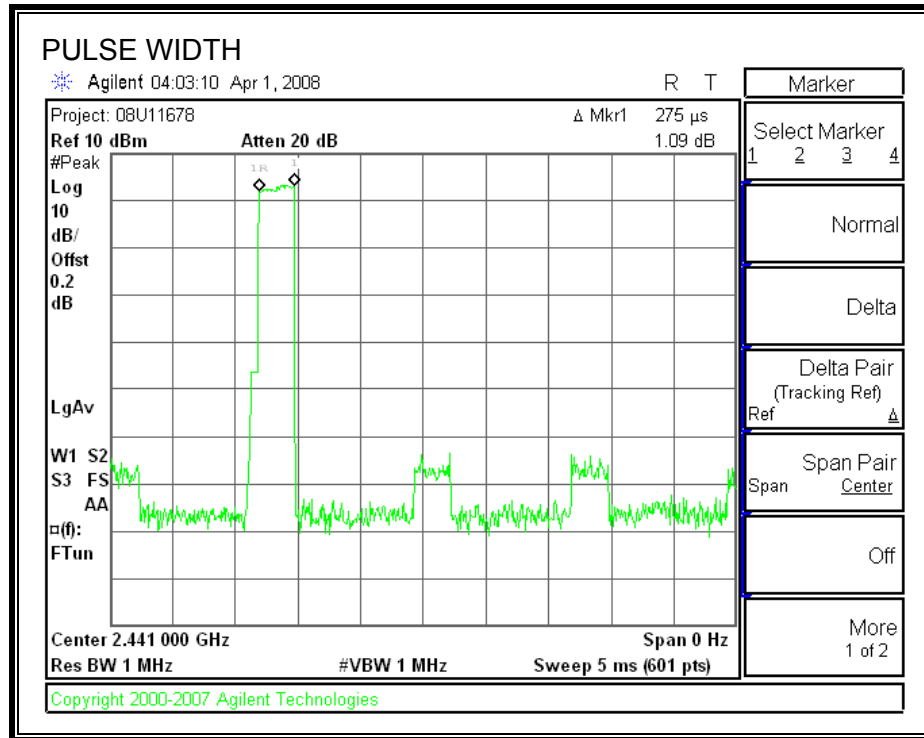
FREQUENCY PACKET DH5



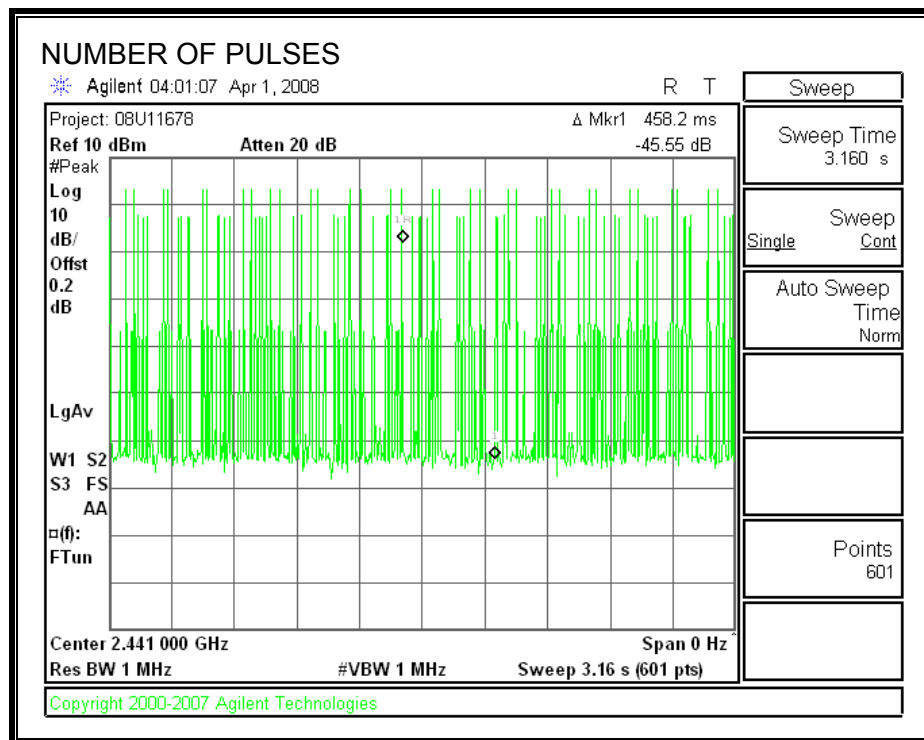
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



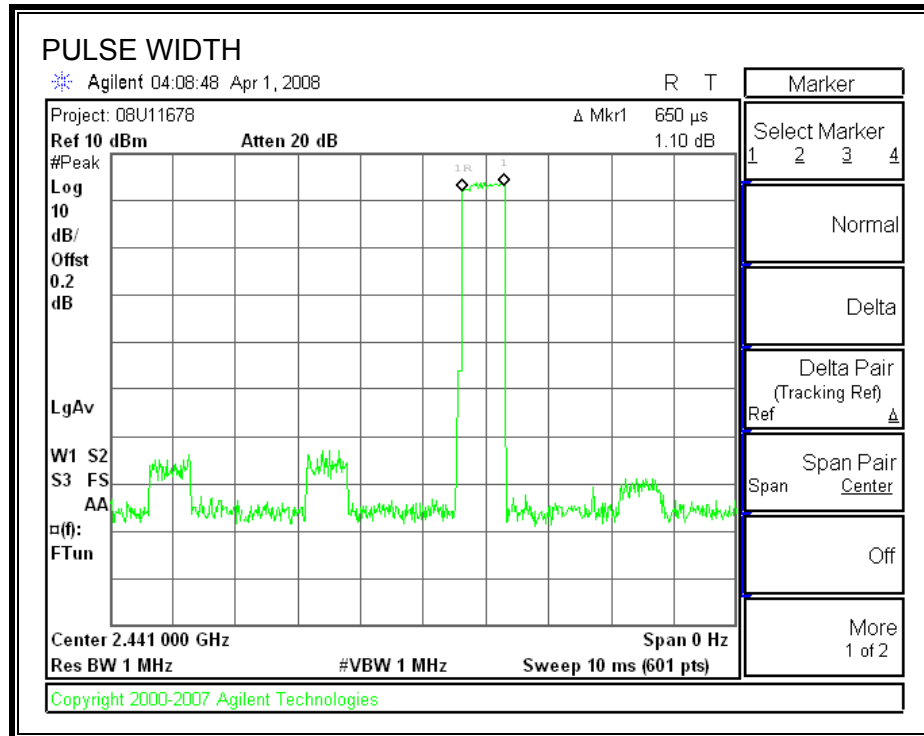
8PSK MODE - FREQUENCY PACKET DH1



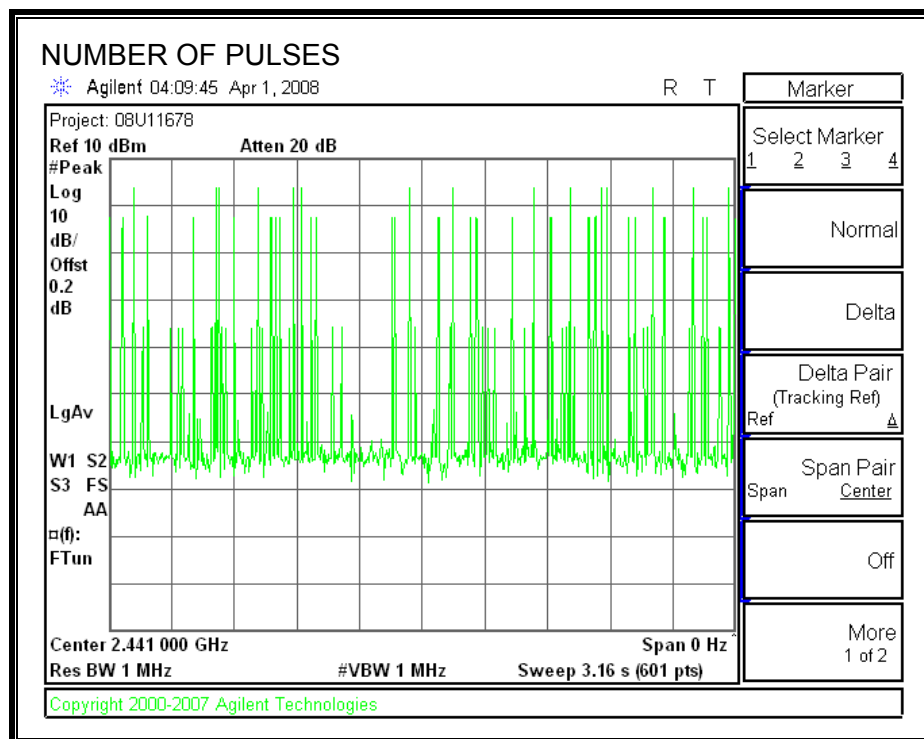
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



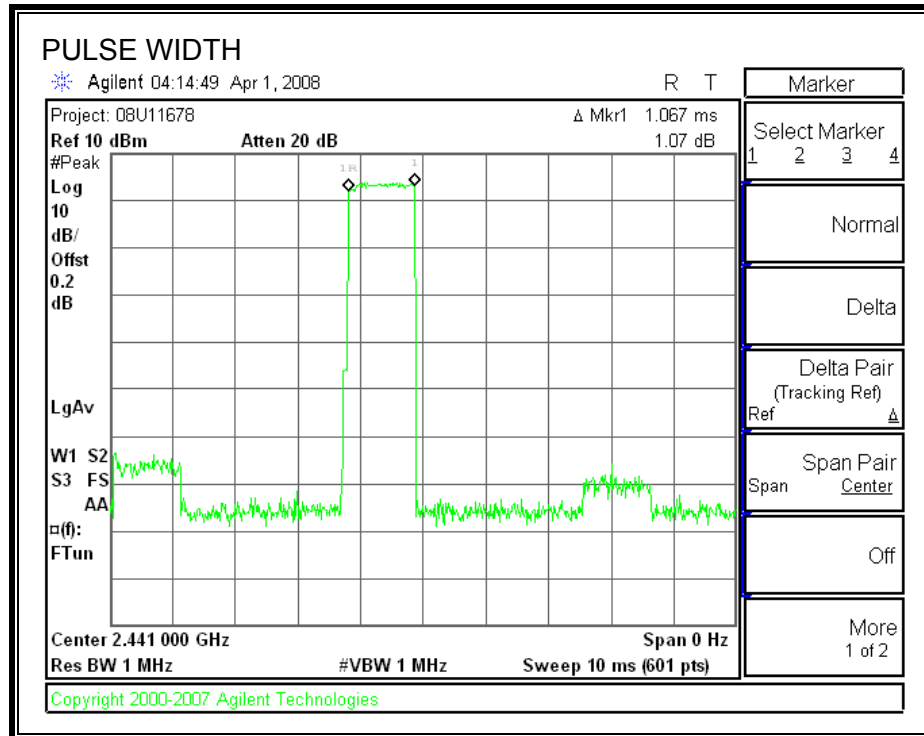
FREQUENCY PACKET DH3



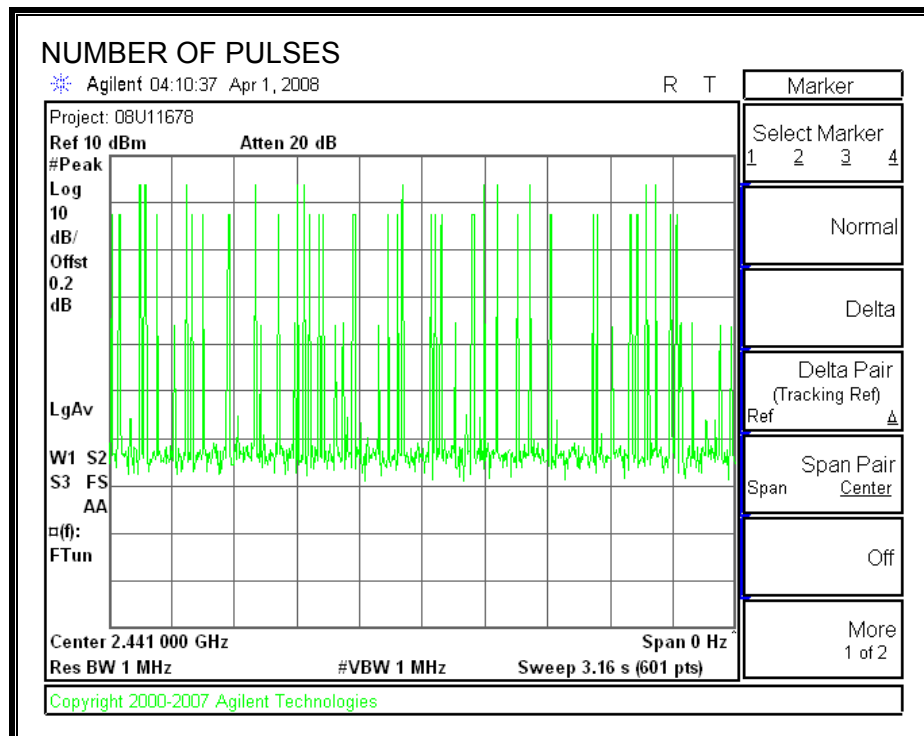
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



FREQUENCY PACKET DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.1.4. 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

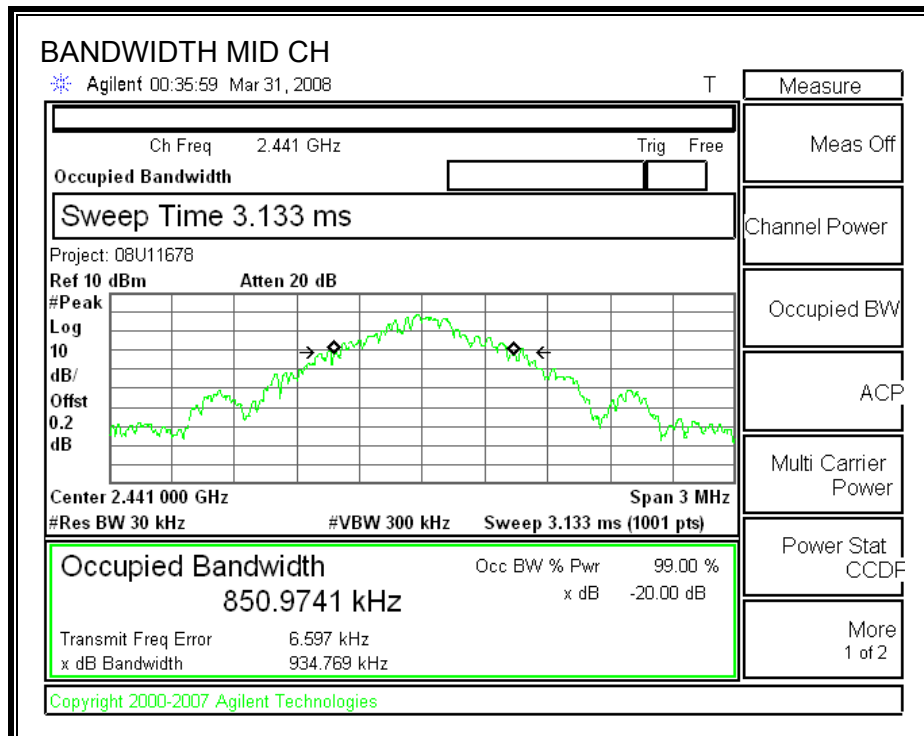
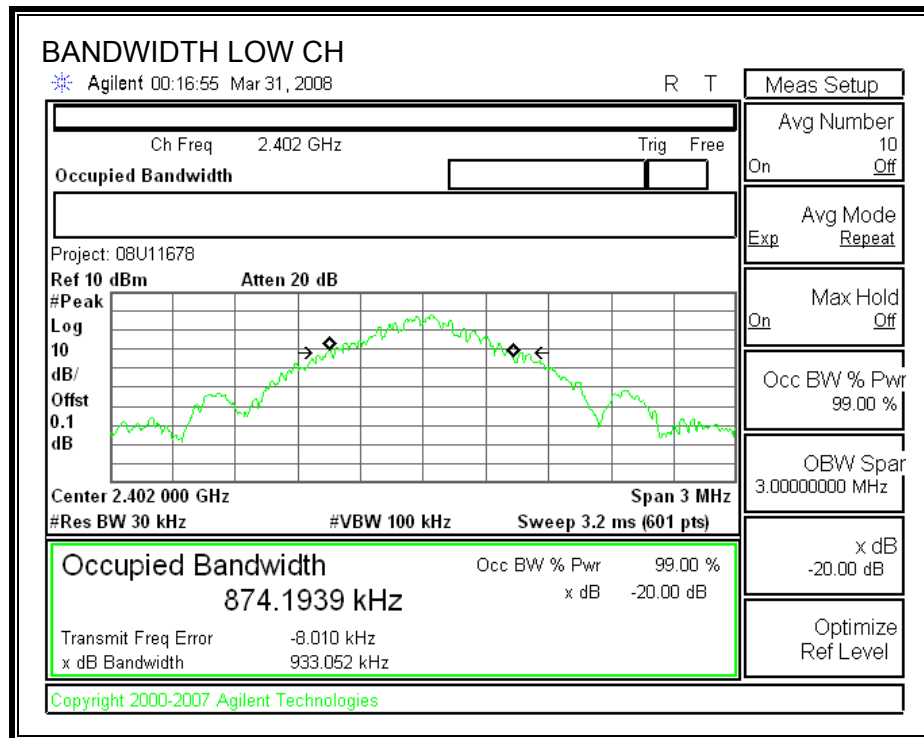
GFSK MODE

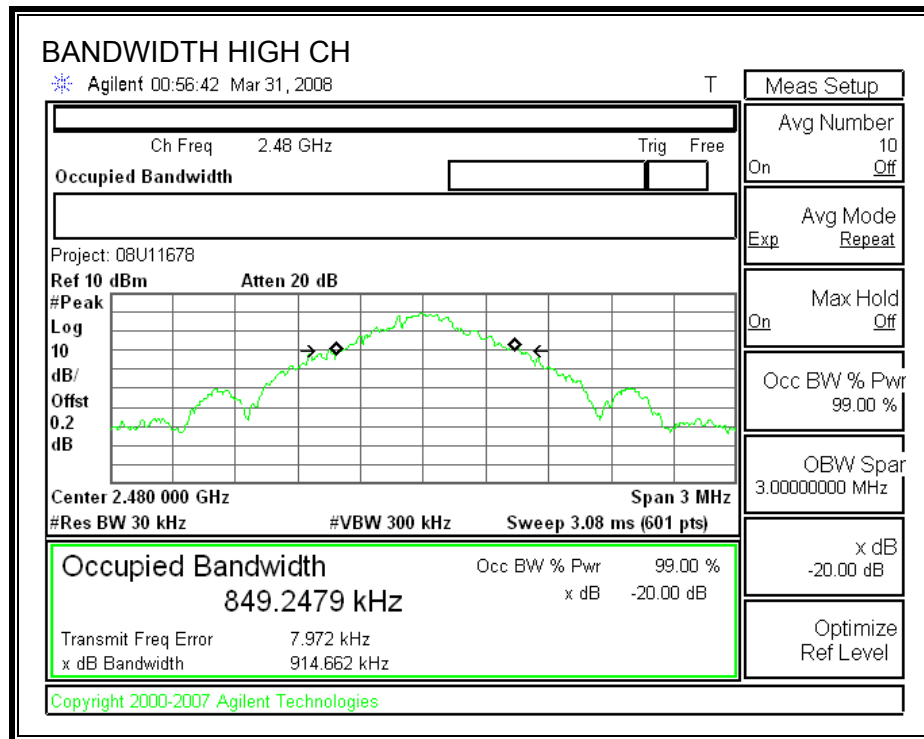
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
0	2402	933.052	863.735
39	2441	934.769	859.517
78	2480	914.662	863.854

8PSK MODE

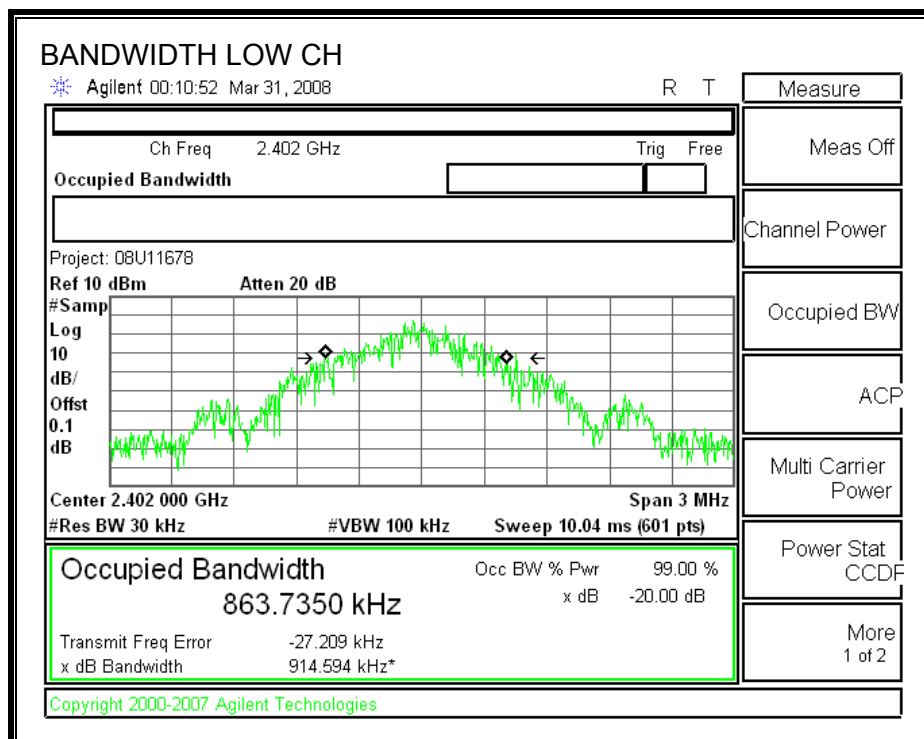
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99% Bandwidth (MHz)
0	2402	1.351	1.202
39	2441	1.339	1.203
78	2480	1.360	1.208

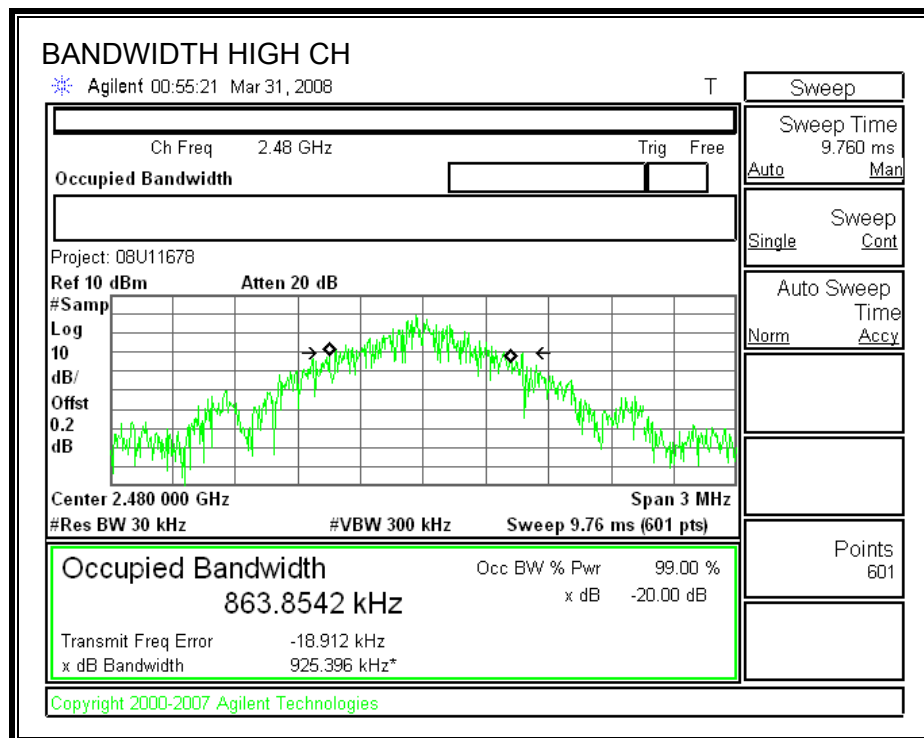
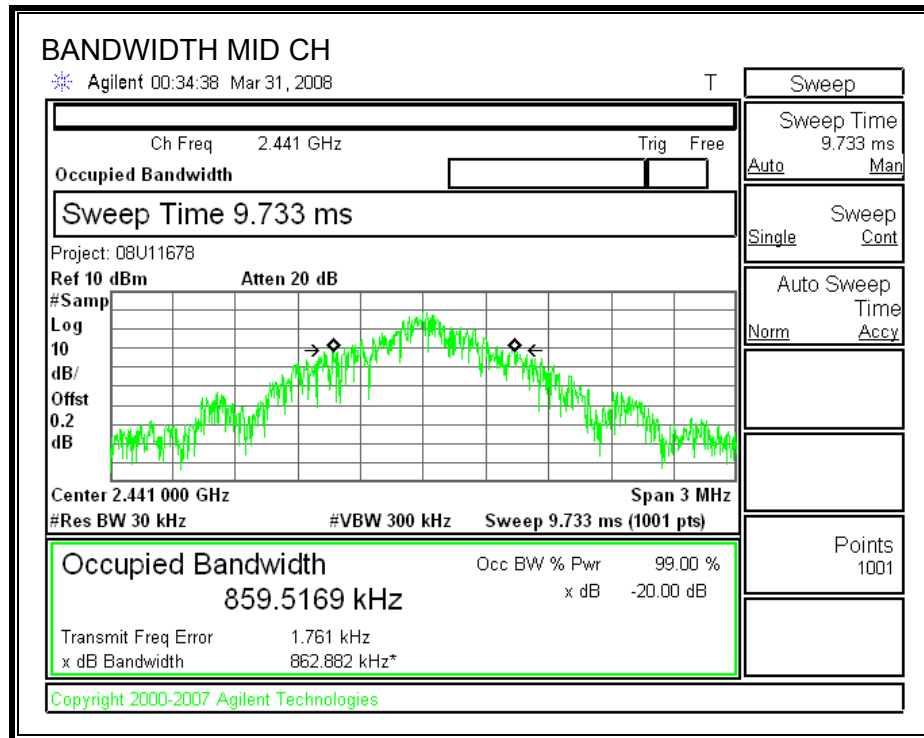
GFSK MODE
20 dB BANDWIDTH



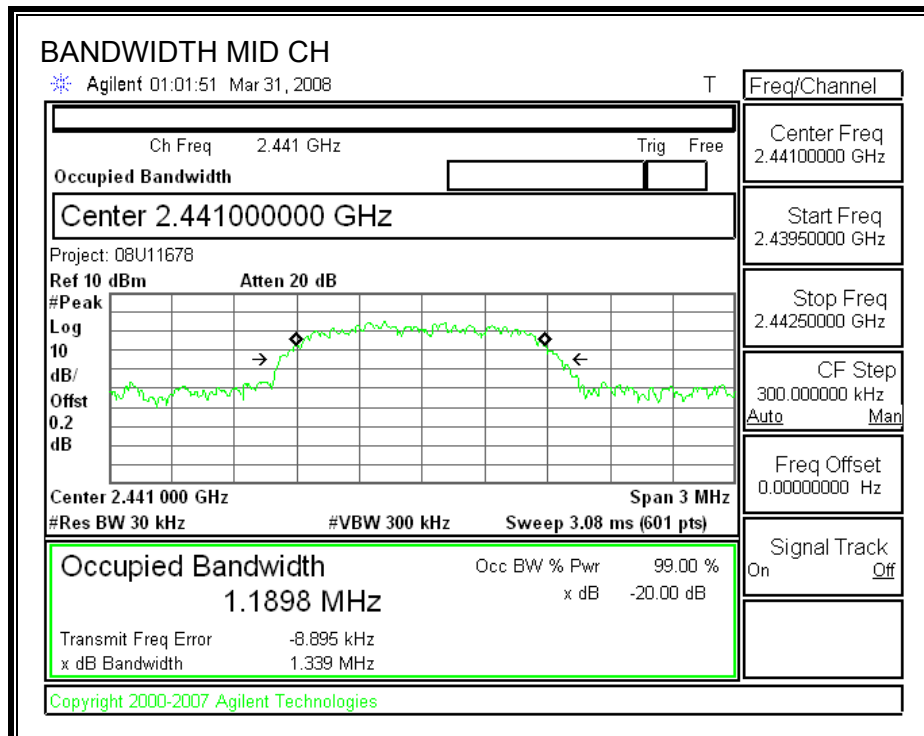
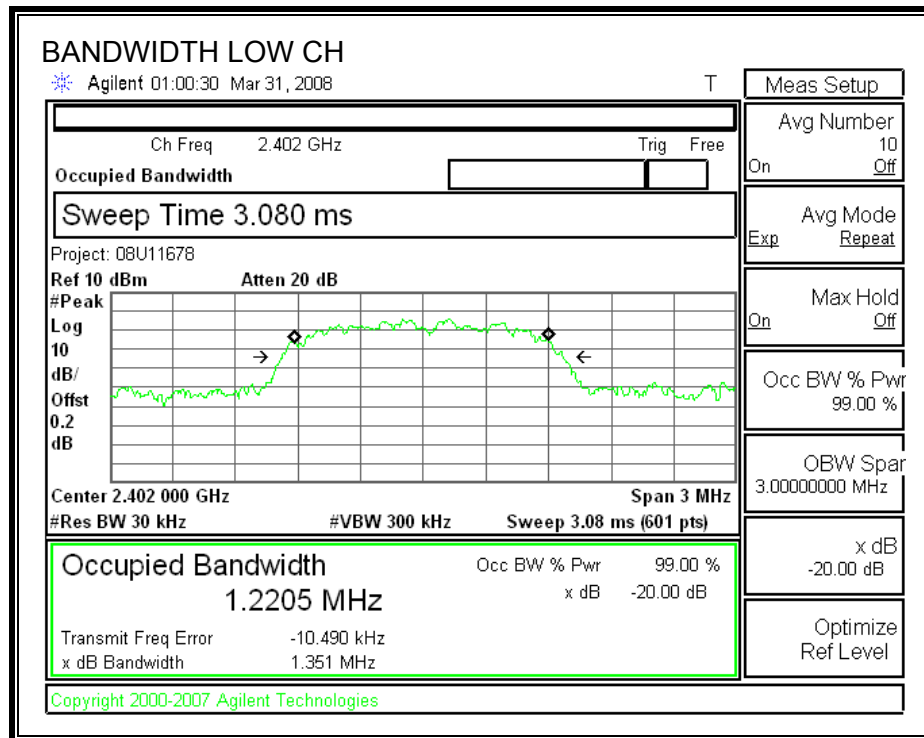


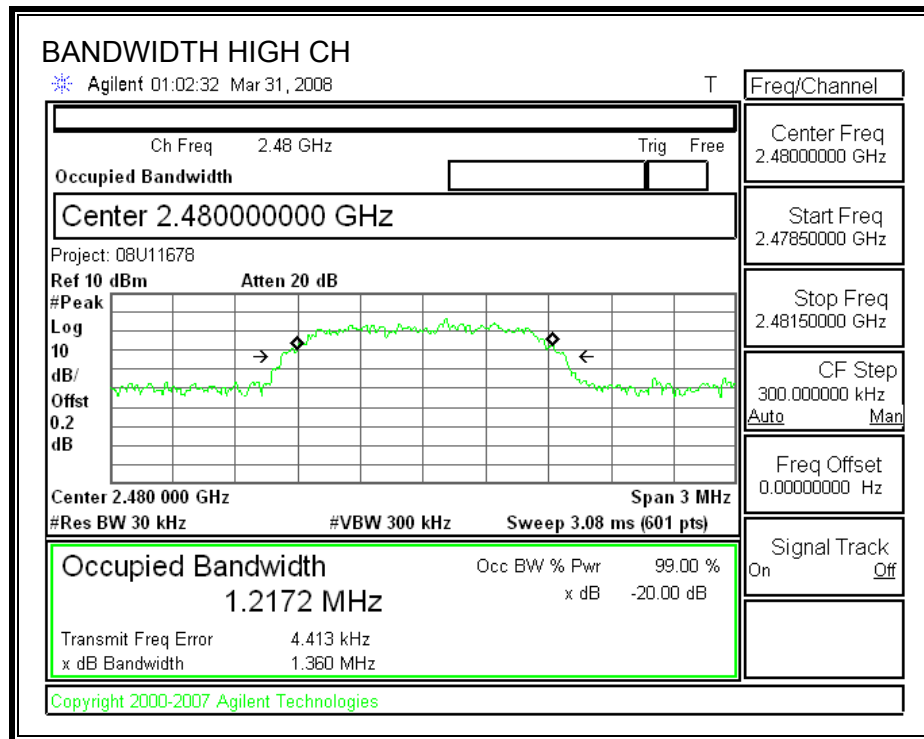
99% BANDWIDTH



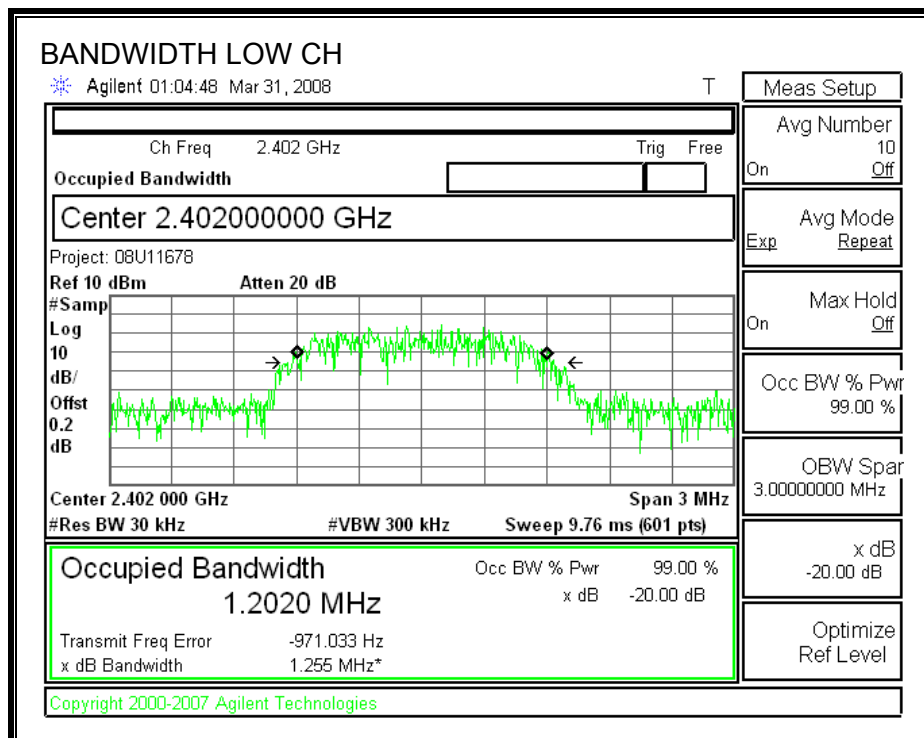


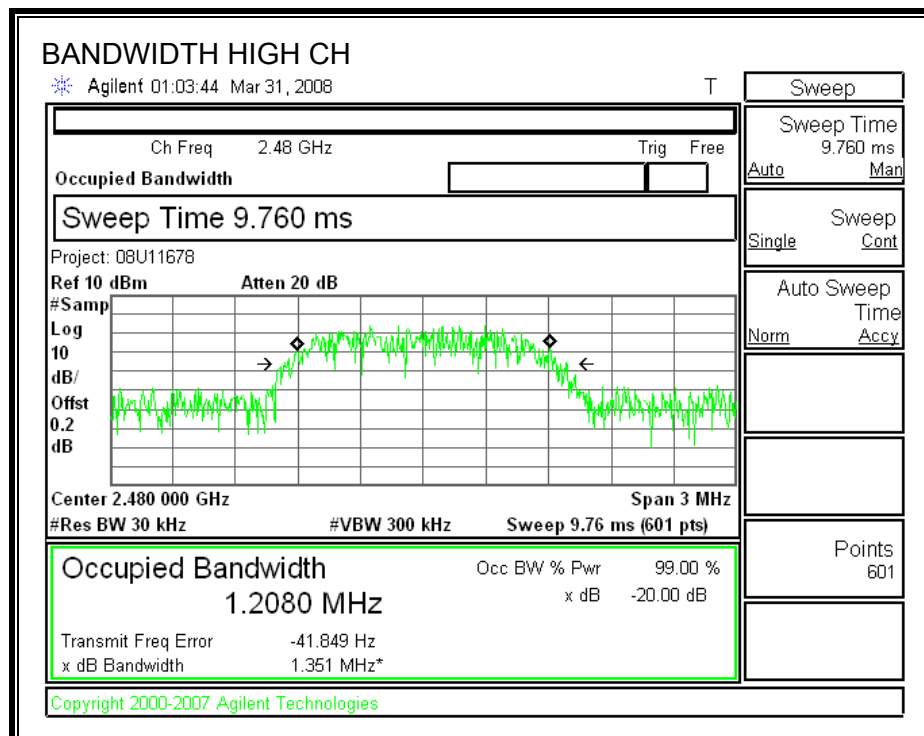
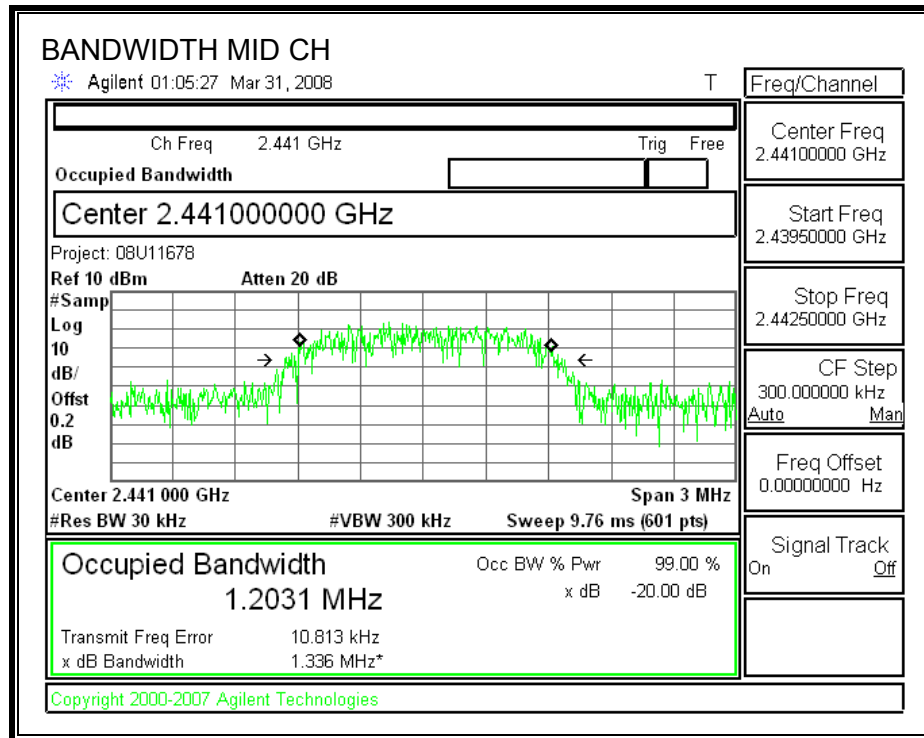
8PSK
20 dB BANDWIDTH





99% BANDWIDTH





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

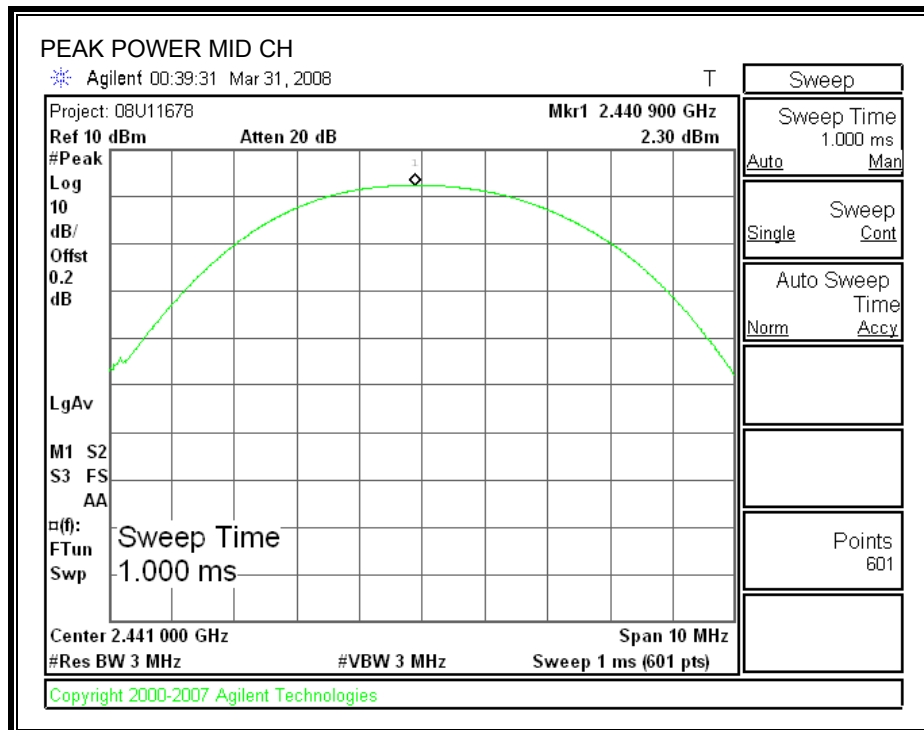
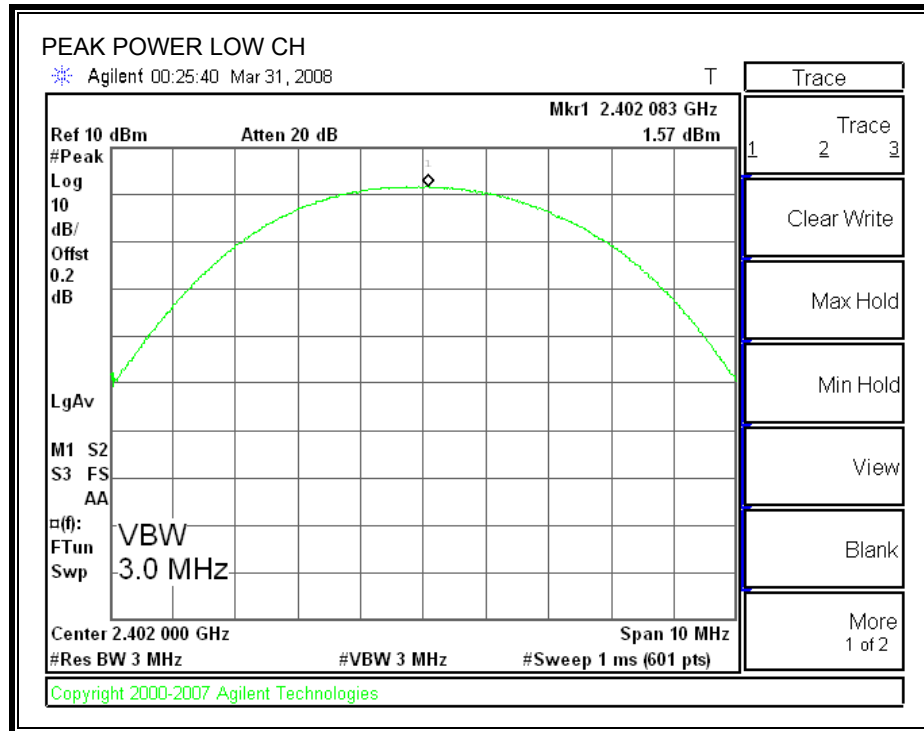
GFSK MODE

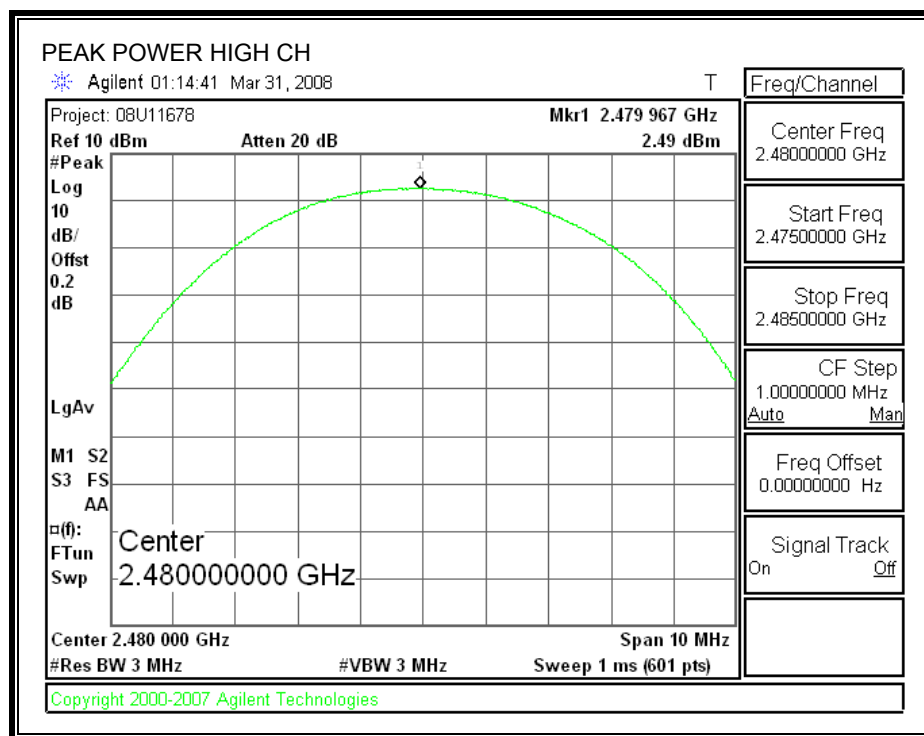
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
0	2402	1.57	30	-28.43
39	2441	2.30	30	-27.70
78	2480	2.49	30	-27.51

8PSK MODE

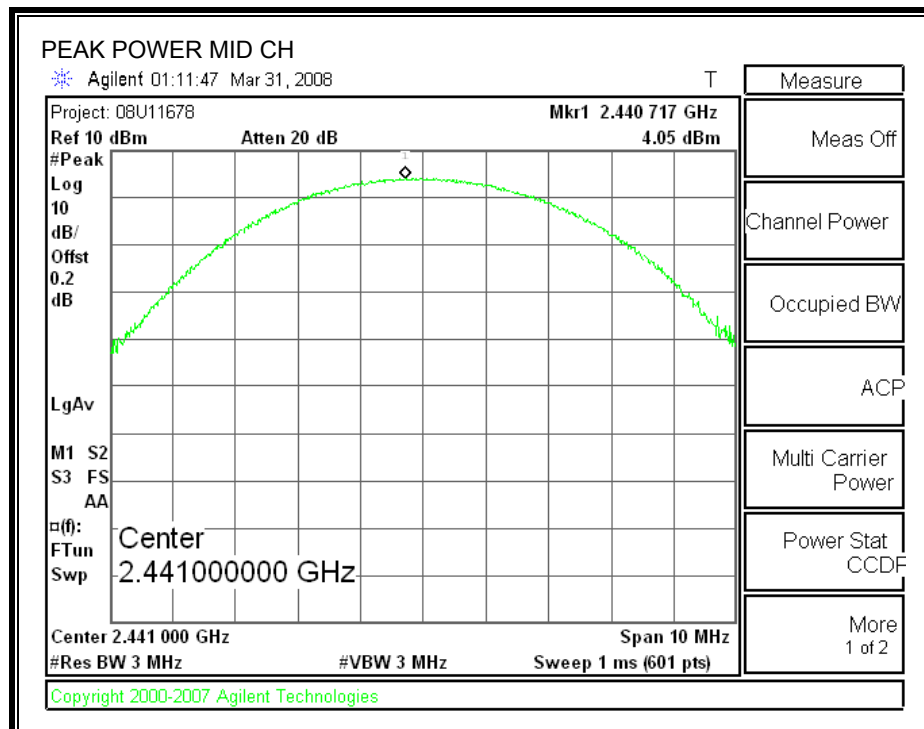
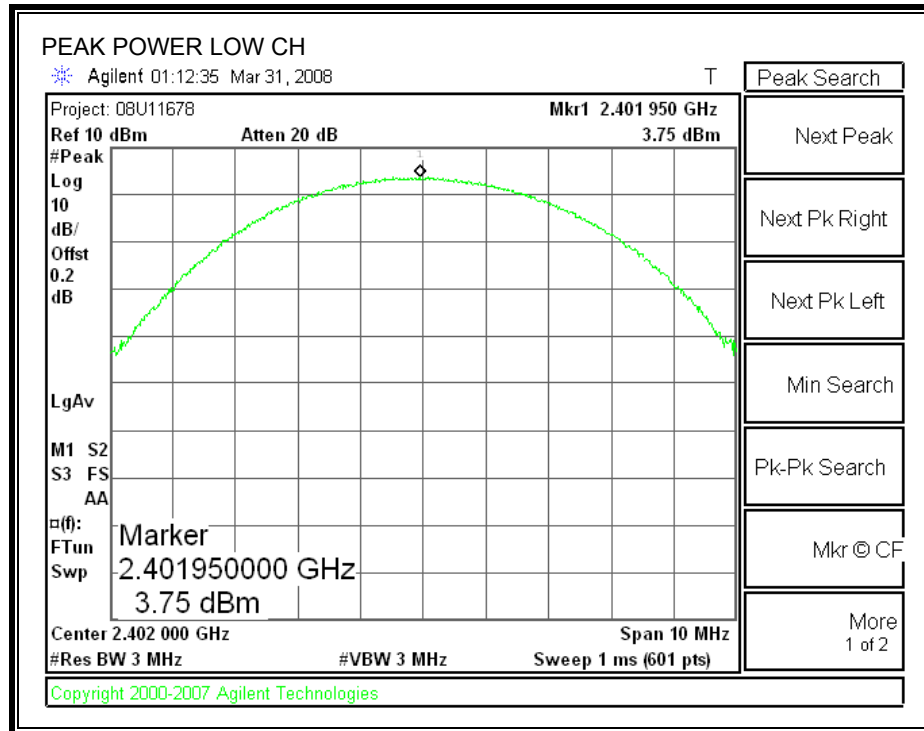
Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
0	2402	3.75	30	-26.25
39	2441	4.05	30	-25.95
78	2480	4.23	30	-25.77

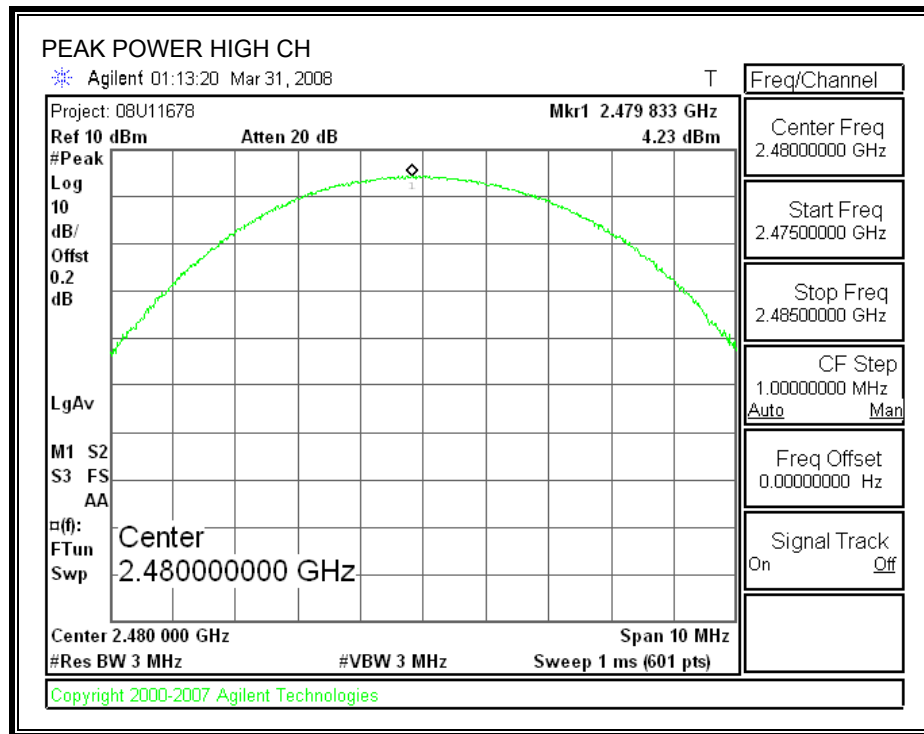
OUTPUT POWER - GFSK





OUTPUT POWER – 8PSK





7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

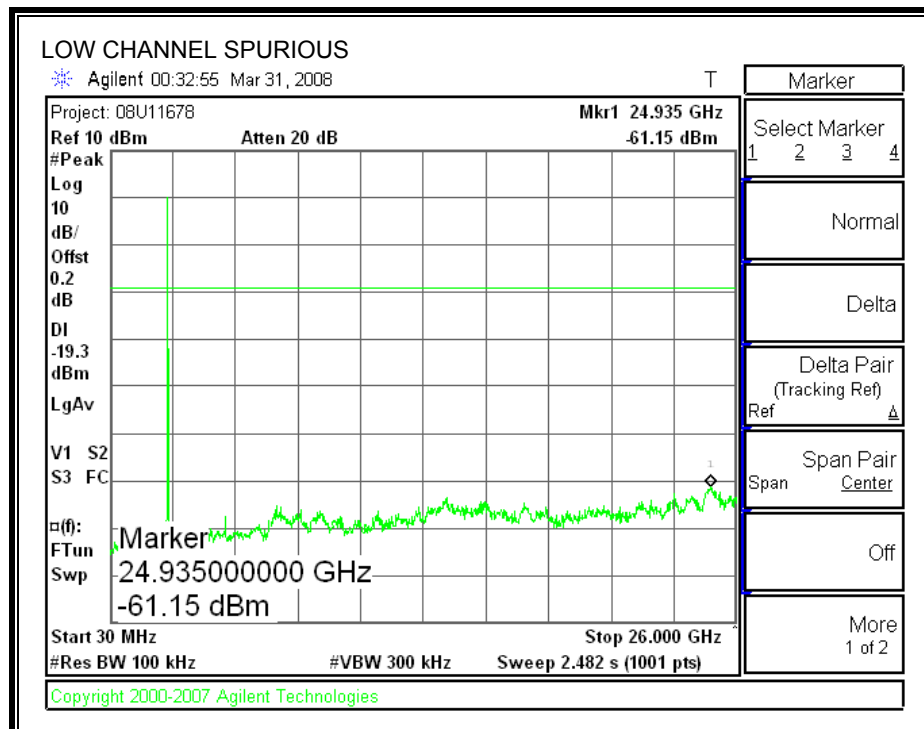
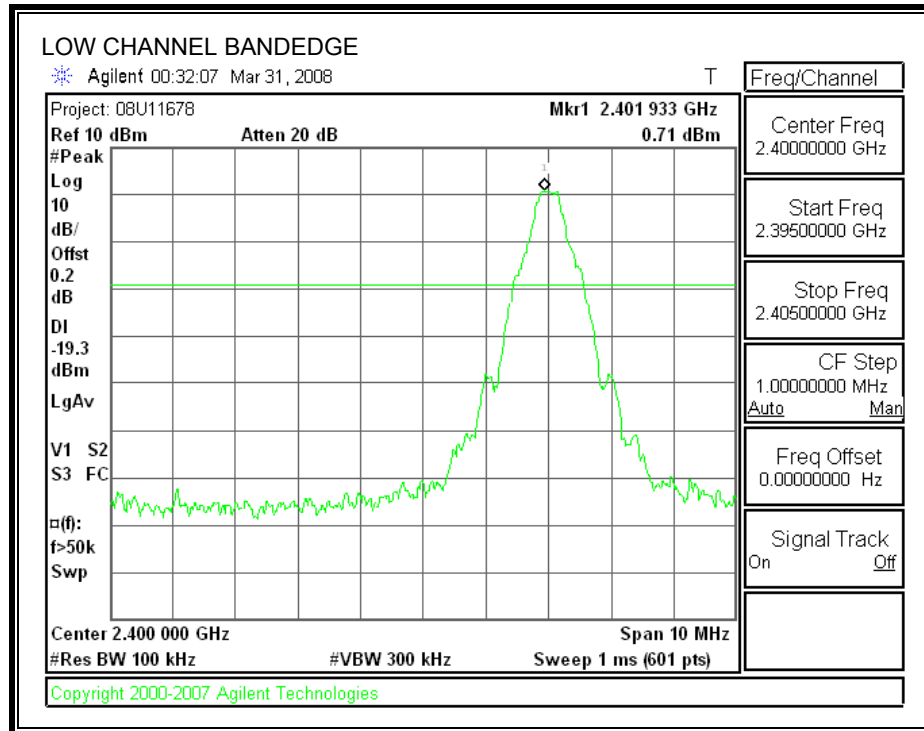
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

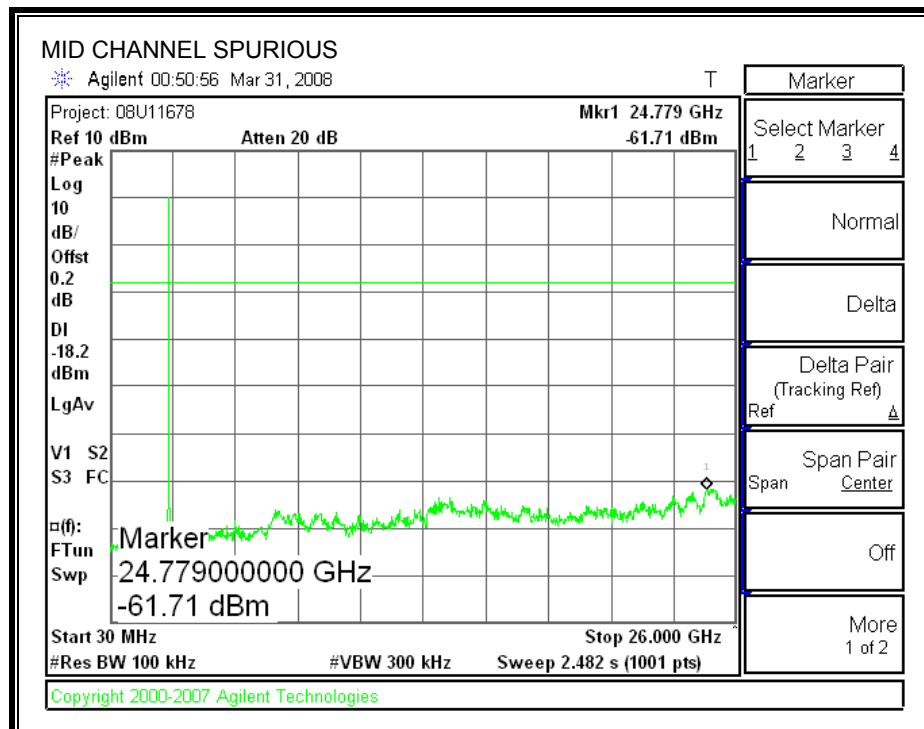
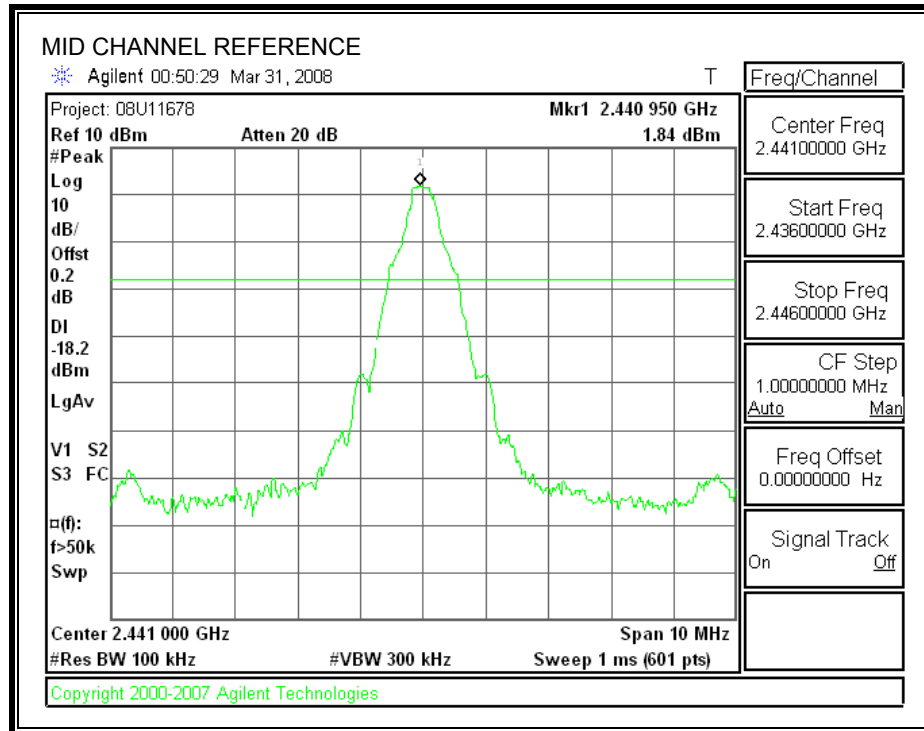
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

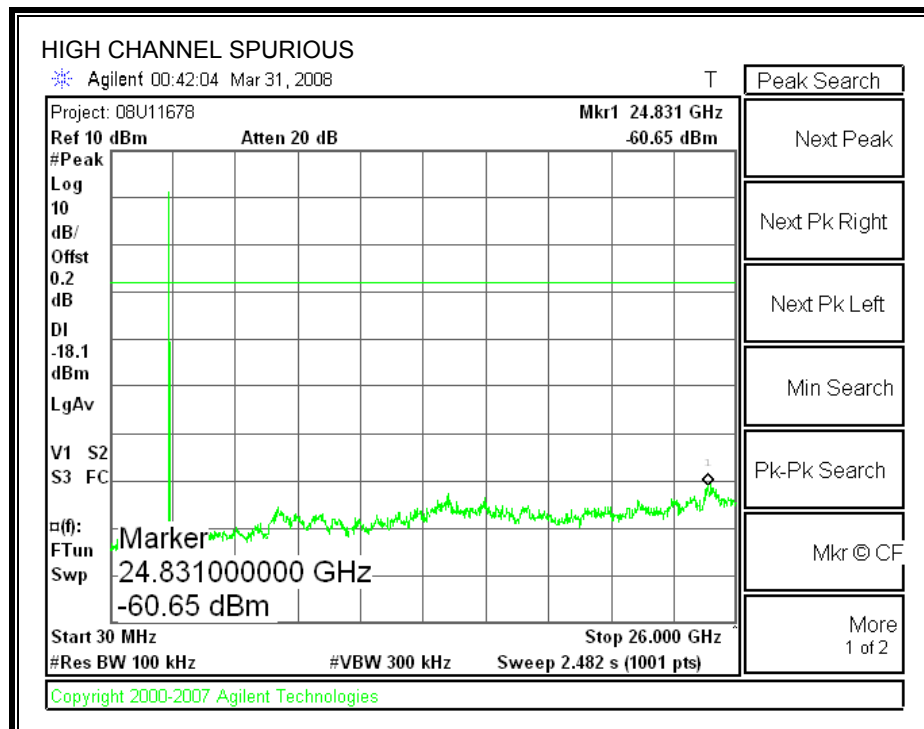
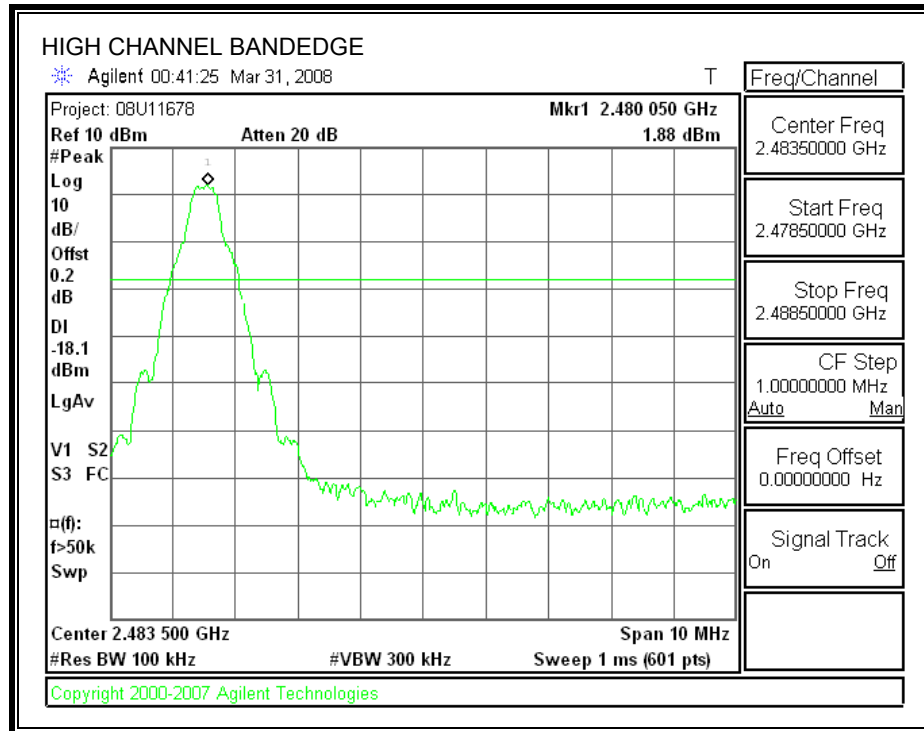
SPURIOUS EMISSIONS, LOW CHANNEL – GFSK MODE



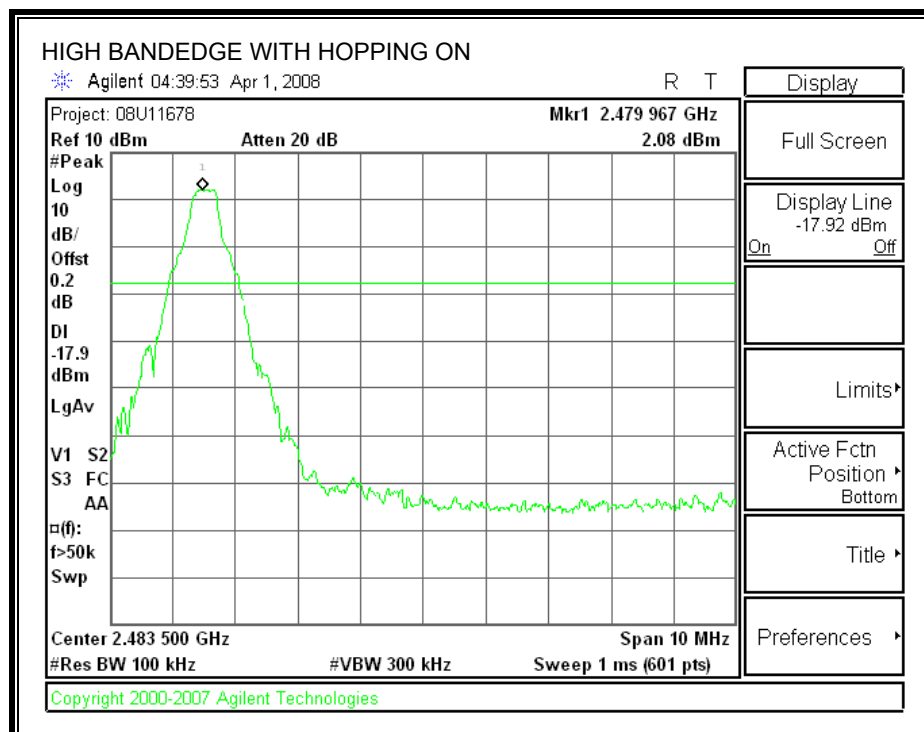
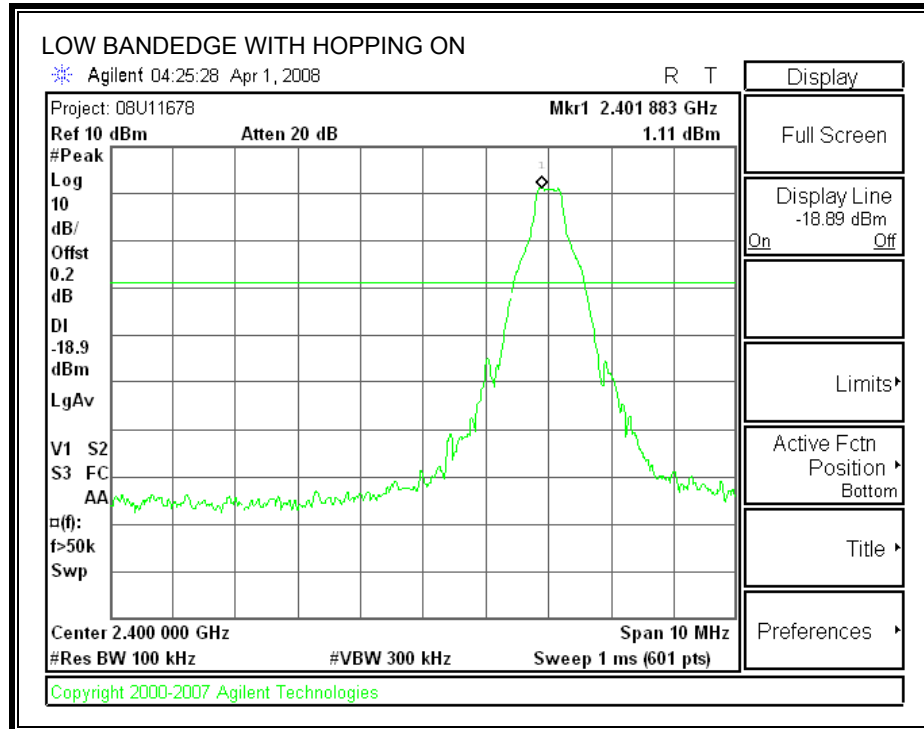
SPURIOUS EMISSIONS, MID CHANNEL – GFSK MODE



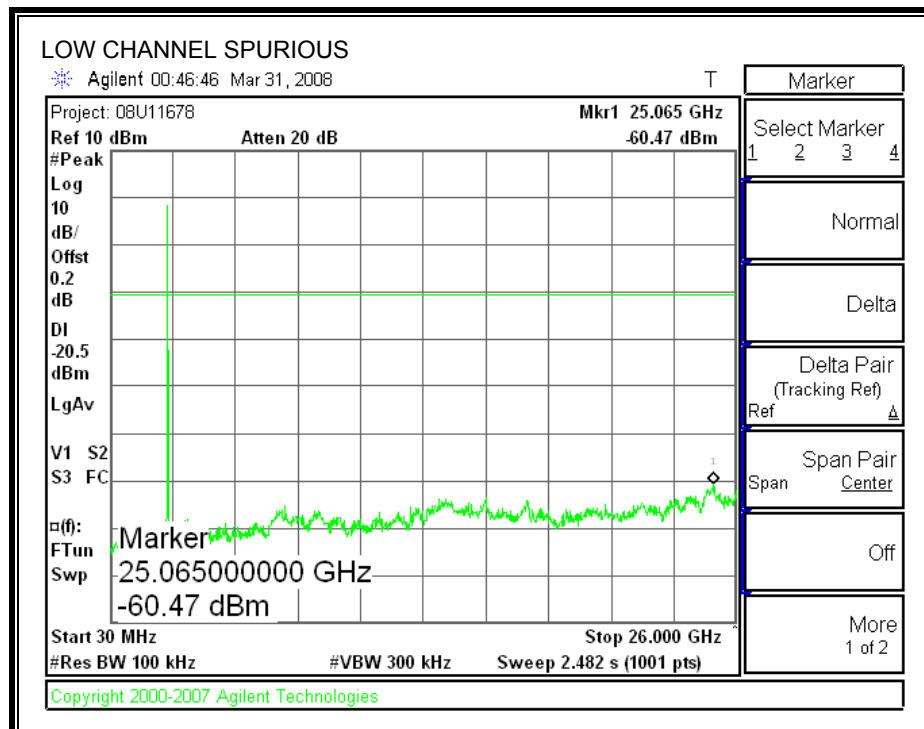
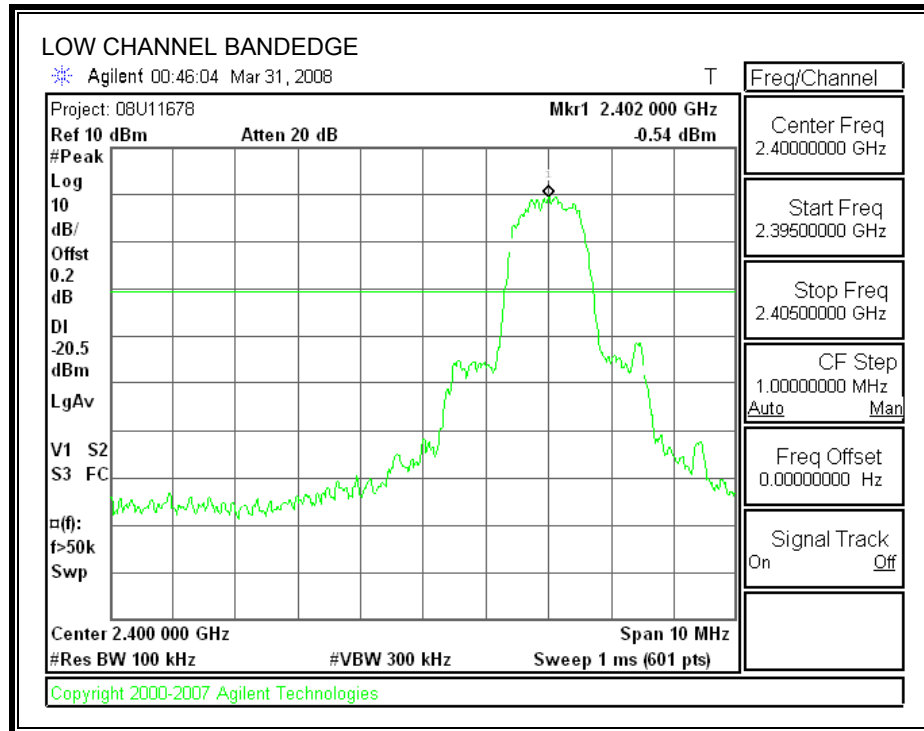
SPURIOUS EMISSIONS, HIGH CHANNEL – GFSK MODE



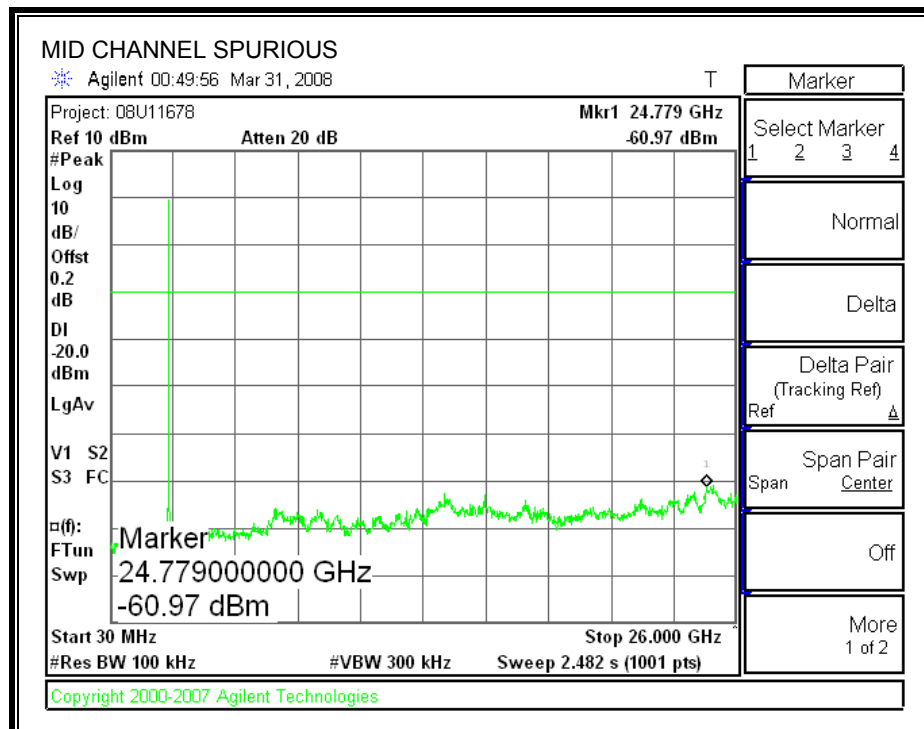
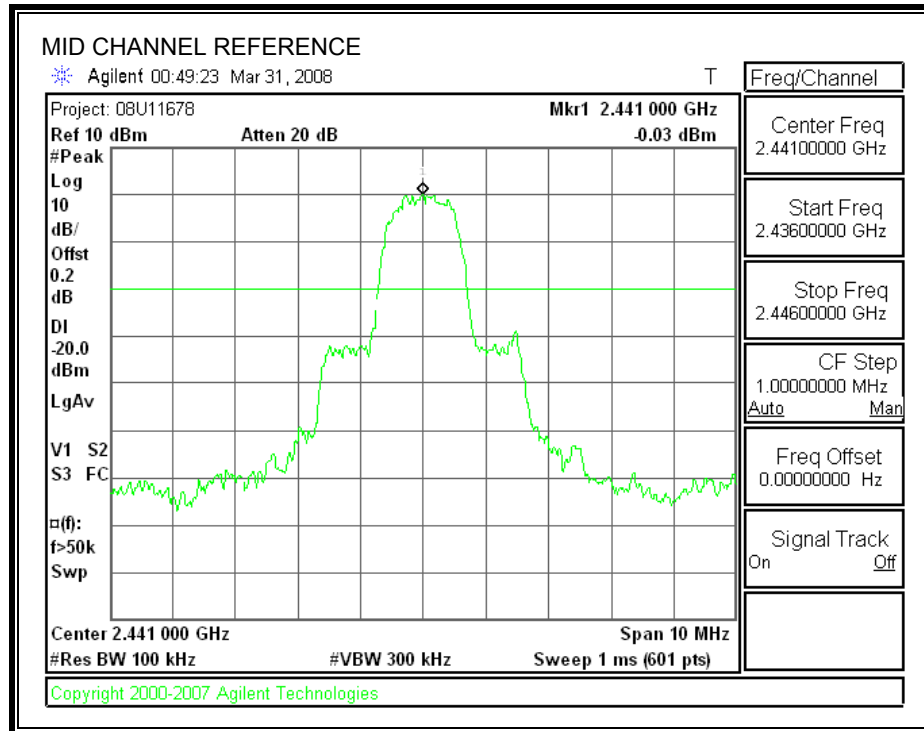
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON – GFSK MODE



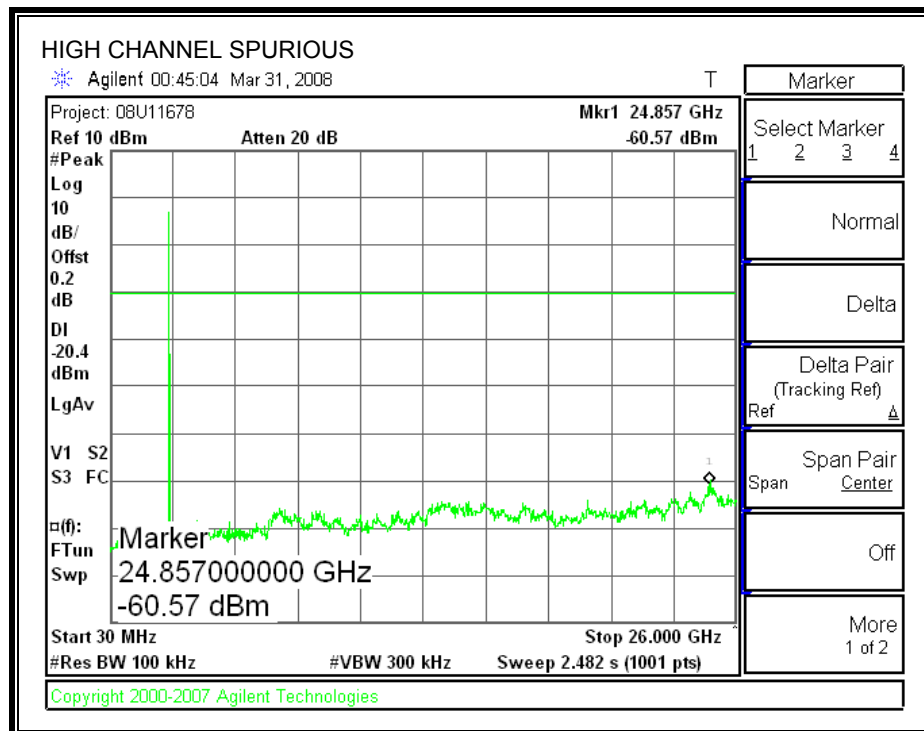
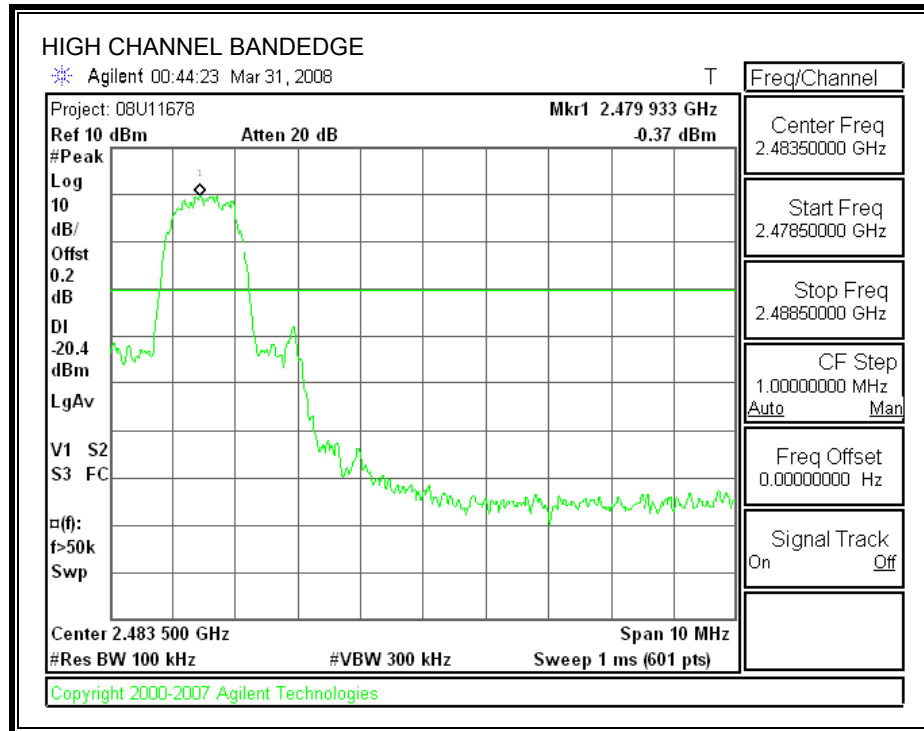
SPURIOUS EMISSIONS, LOW CHANNEL – 8PSK MODE



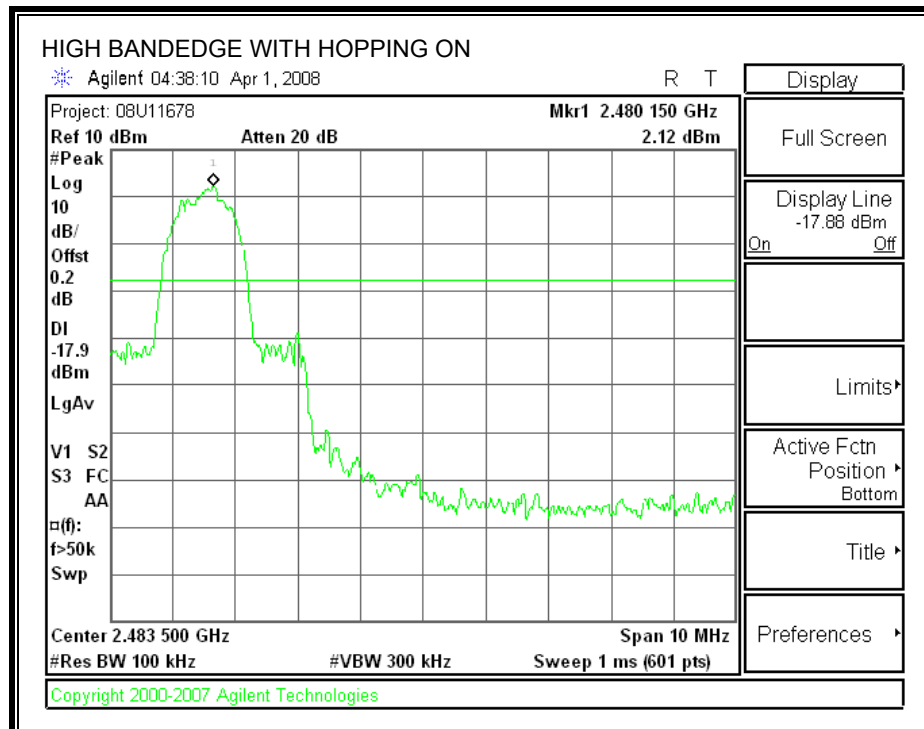
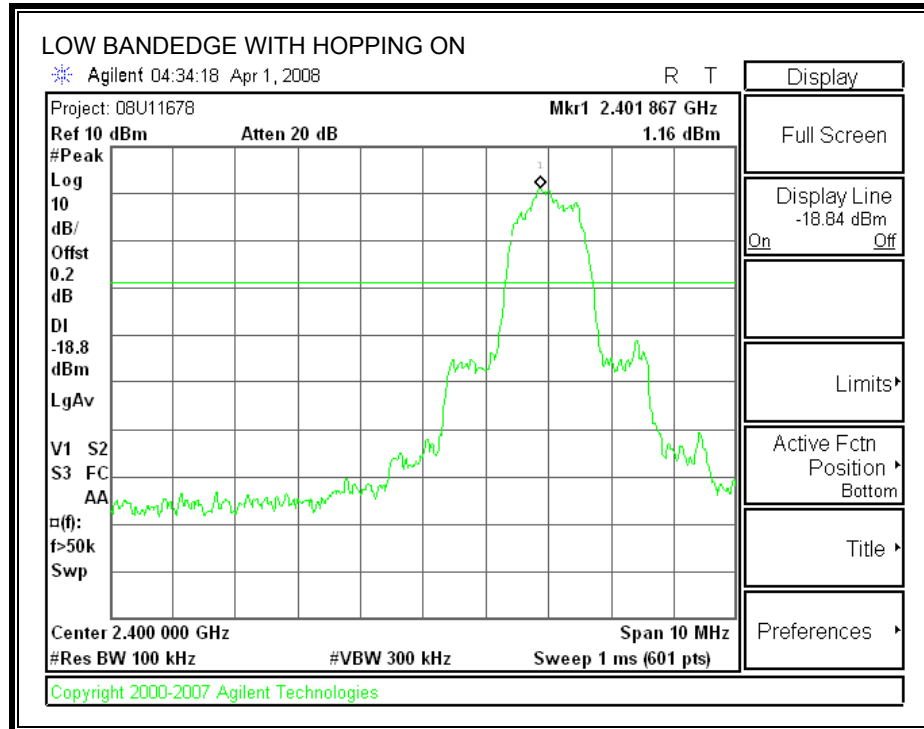
SPURIOUS EMISSIONS, MID CHANNEL – 8PSK MODE



SPURIOUS EMISSIONS, HIGH CHANNEL – 8PSK MODE



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON – 8PSK MODE



8. RADIATED TEST RESULTS

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.

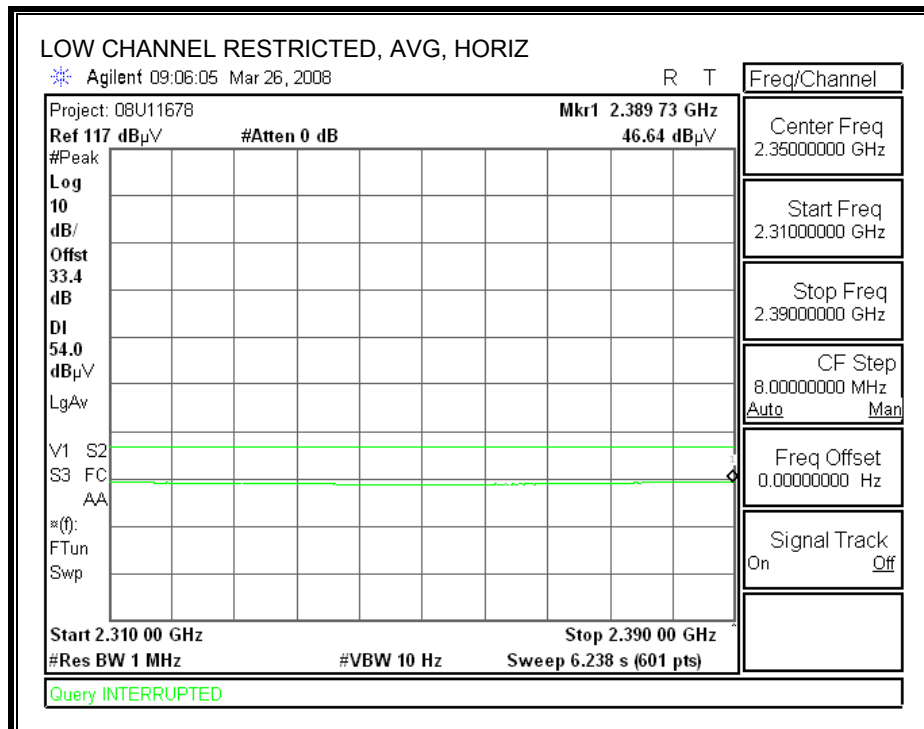
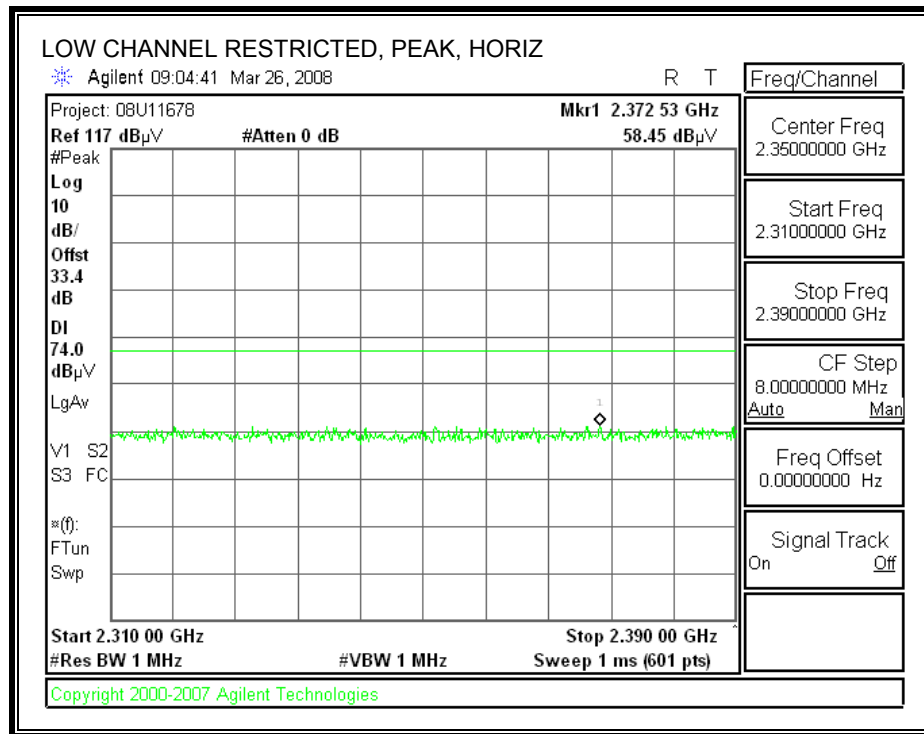
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

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.

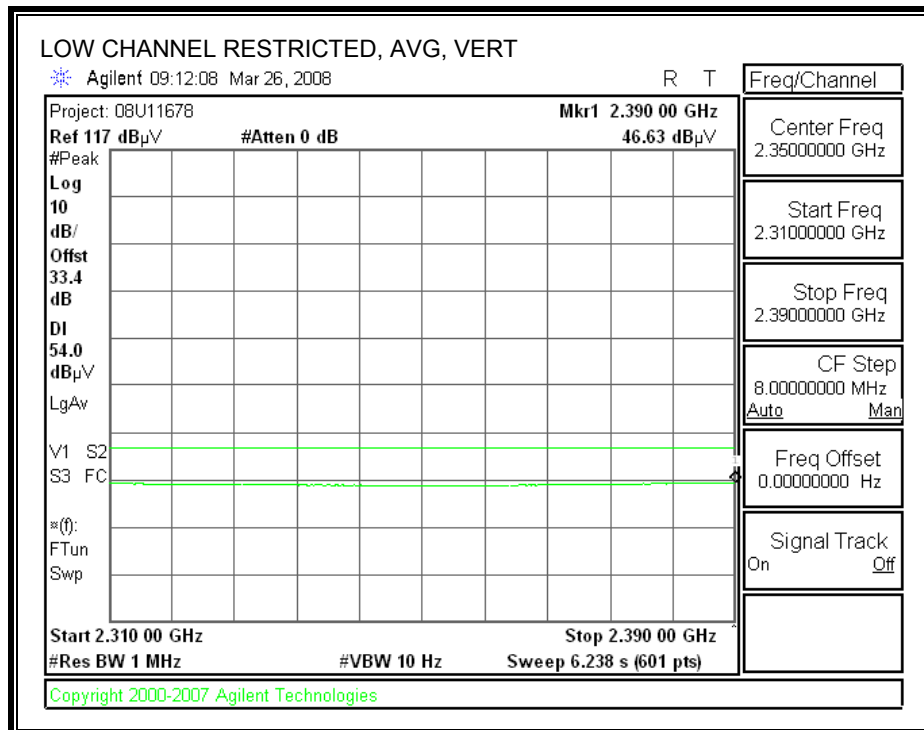
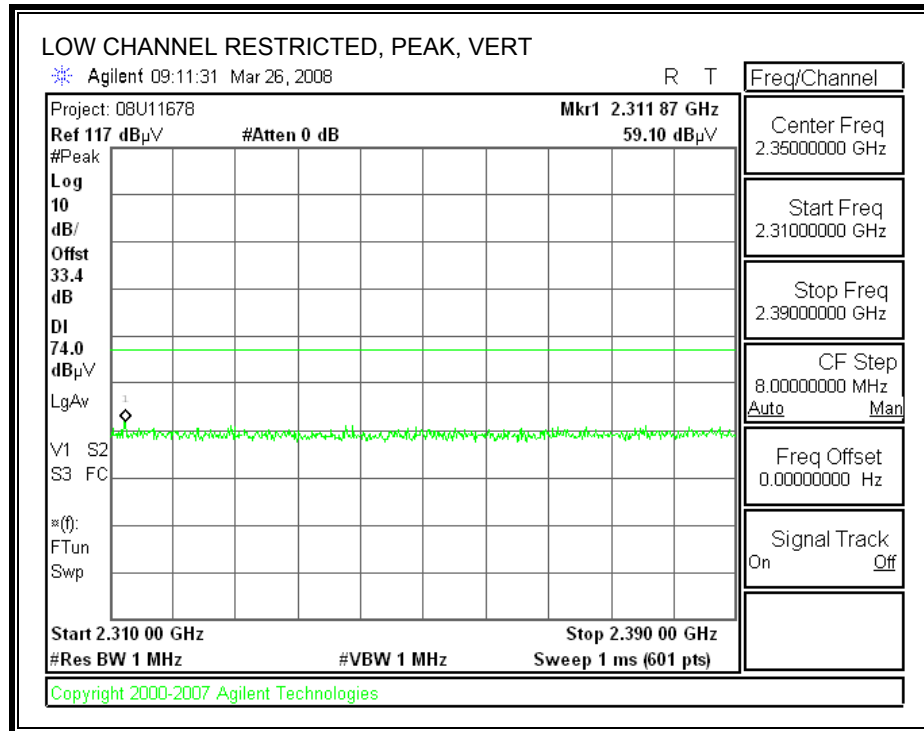
8.1. TRANSMITTER ABOVE 1 GHz

8.1.1. GFSK MODE

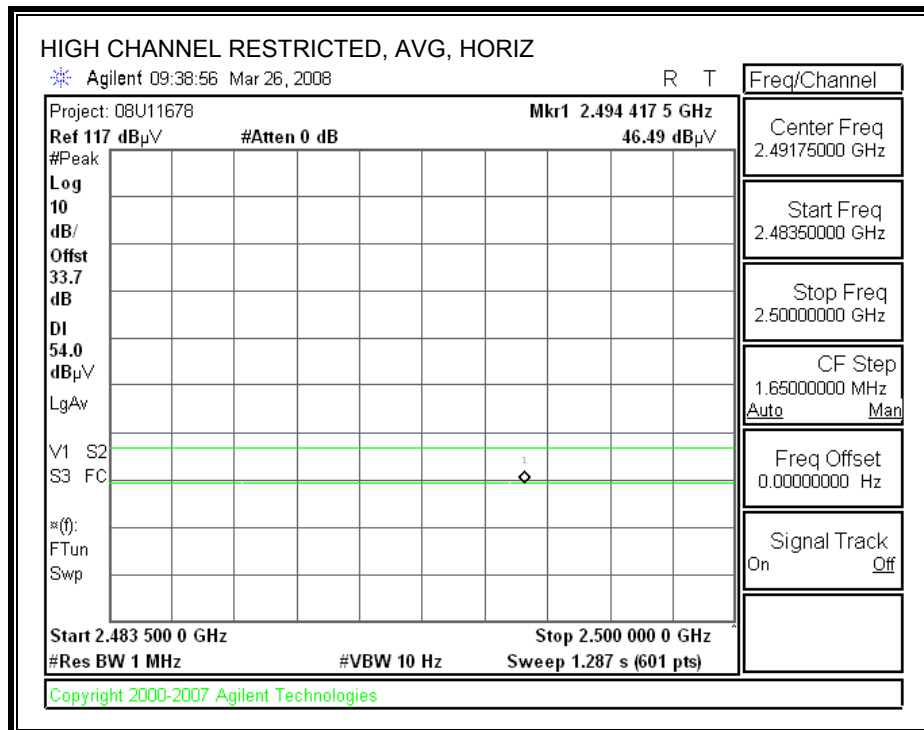
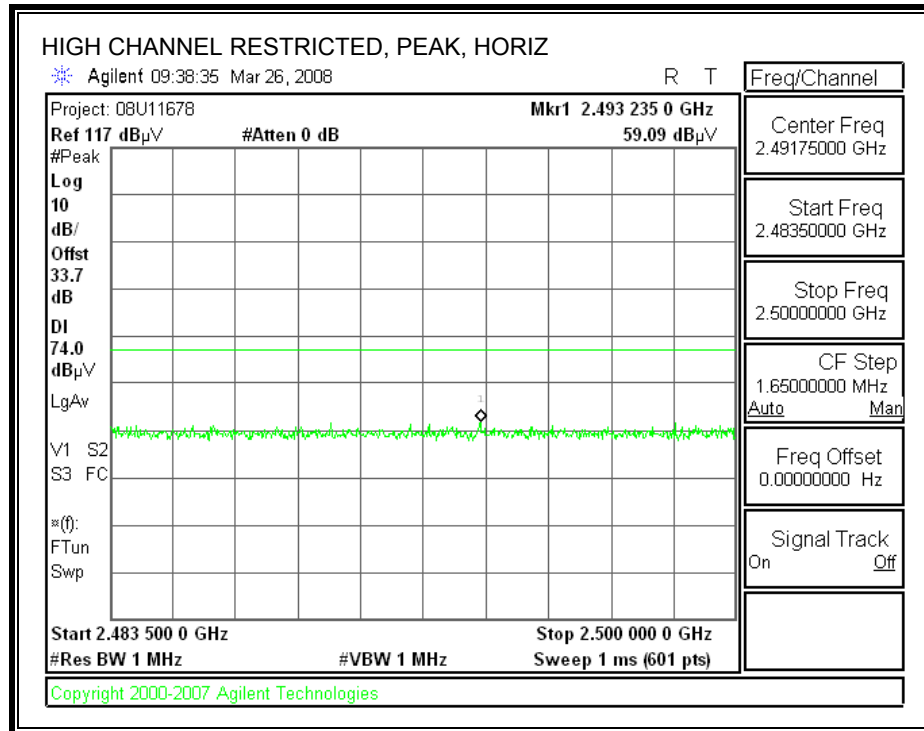
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



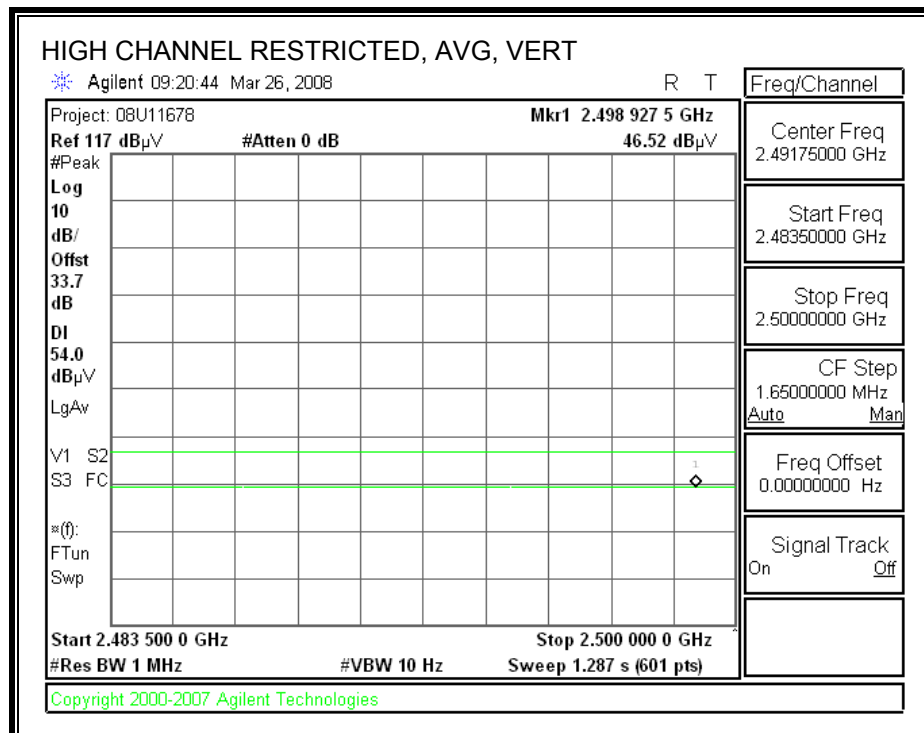
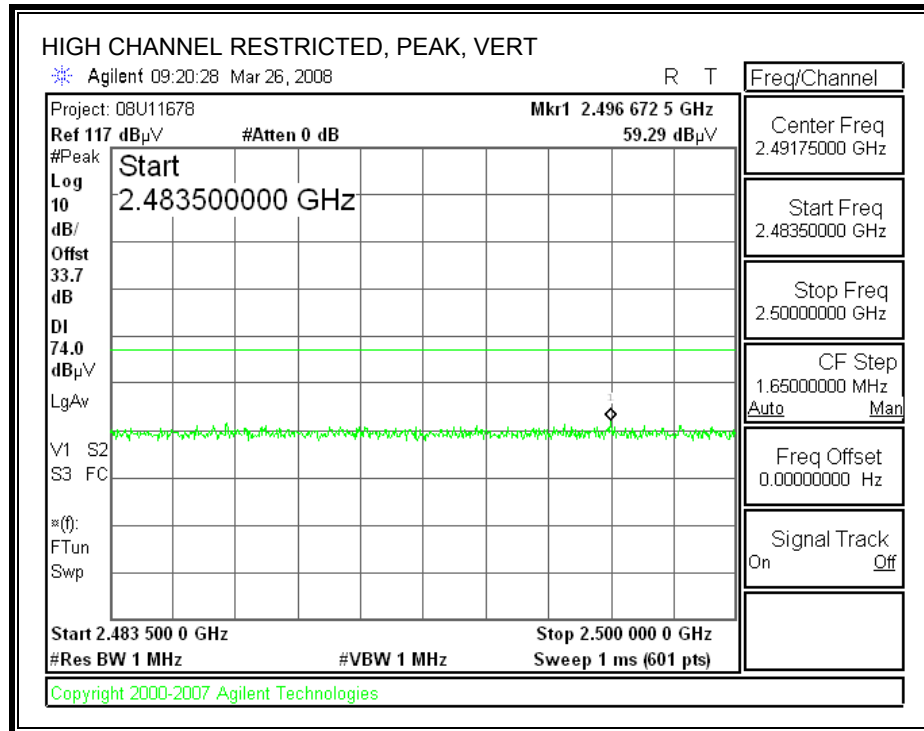
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

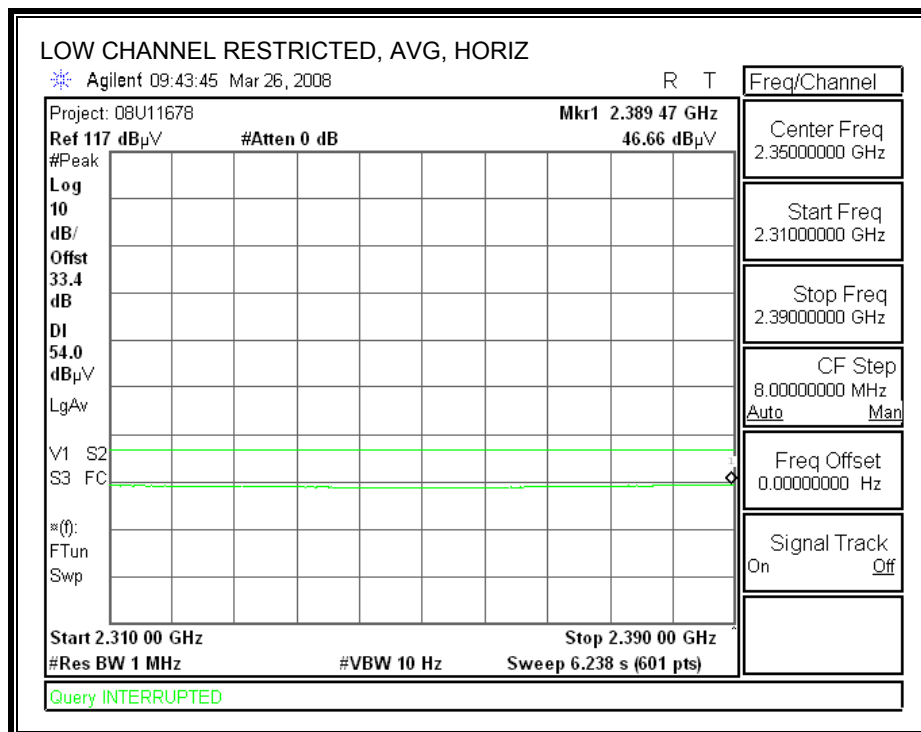
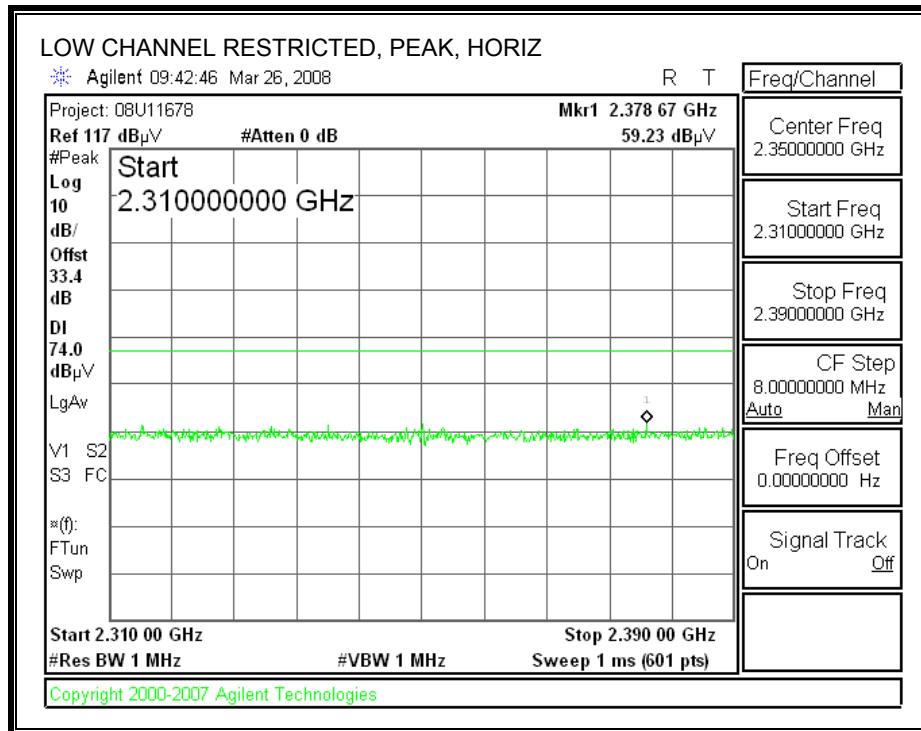


HARMONICS AND SPURIOUS EMISSIONS – GFSK MODE

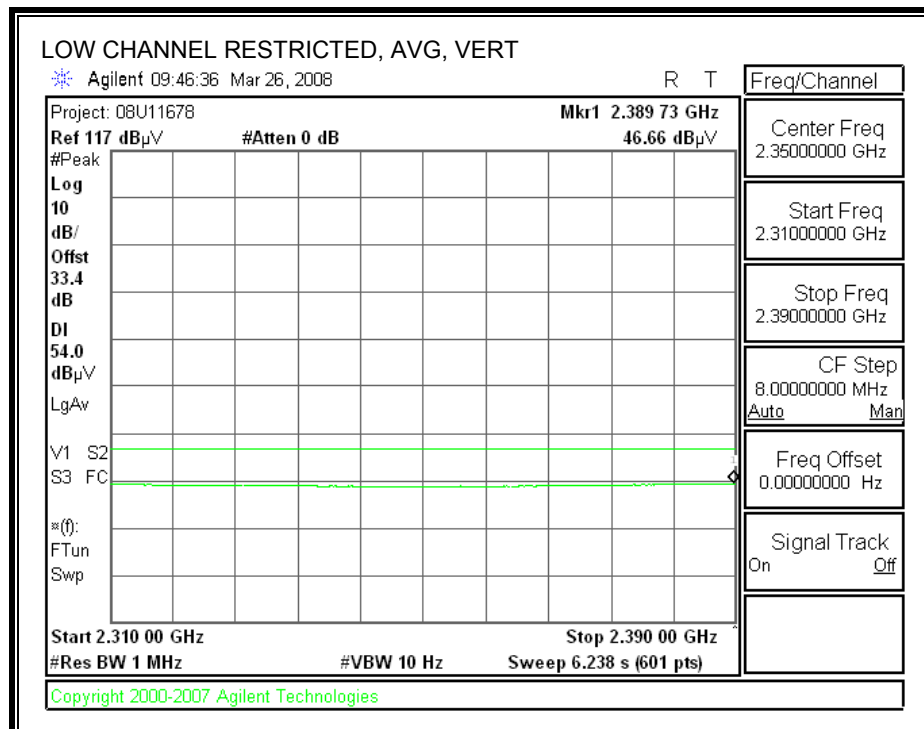
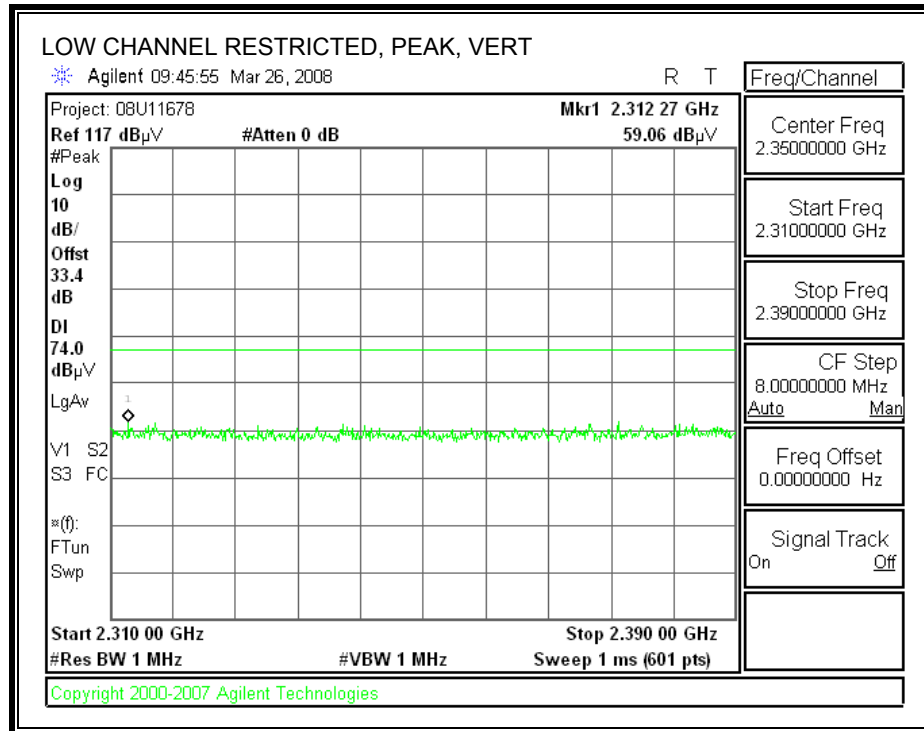
High Frequency Measurement															
Compliance Certification Services, Fremont 5m Chamber															
Company:		Broadcom													
Project #:		08U11678													
Date:		3/26/2008													
Test Engineer:		Vien Tran													
Configuration:		EUT / Laptop													
Mode:		Tx GFSK Mode													
Test Equipment:															
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit							
T60; S/N: 2238 @3m		T34 HP 8449B						FCC 15.205							
Hi Frequency Cables															
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz					
				A-5m Chamber		HPF_4.0GHz									
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)
LOW CHANNEL, 2402 MHz															
4804	3.0	40.5	28.9	33.0	6.9	-34.8	0.0	0.6	46.1	34.5	74	54	-27.9	-19.5	V
4804	3.0	41.5	29.5	33.0	6.9	-34.8	0.0	0.6	47.1	35.1	74	54	-26.9	-18.9	H
MID CHANNEL, 2441 MHz															
4882	3.0	40.3	28.7	33.1	6.9	-34.8	0.0	0.6	46.1	34.5	74	54	-27.9	-19.5	V
4882	3.0	41.4	29.4	33.1	6.9	-34.8	0.0	0.6	47.2	35.2	74	54	-26.8	-18.8	H
HIGH CHANNEL, 2480MHz															
4960	3.0	40.4	28.6	33.1	7.0	-34.8	0.0	0.6	46.4	34.6	74	54	-27.6	-19.4	V
4960	3.0	41.9	29.6	33.1	7.0	-34.8	0.0	0.6	47.9	35.6	74	54	-26.1	-18.4	H
No emissions were detected above system noise floor															
f	Measurement Frequency		Amp	Preamp Gain		Avg Lim	Average Field Strength Limit								
Dist	Distance to Antenna		D Corr	Distance Correct to 3 meters		Pk Lim	Peak Field Strength Limit								
Read	Analyzer Reading		Avg	Average Field Strength @ 3 m		Avg Mar	Margin vs. Average Limit								
AF	Antenna Factor		Peak	Calculated Peak Field Strength		Pk Mar	Margin vs. Peak Limit								
CL	Cable Loss		HPF	High Pass Filter											

8.1.2. 8PSK MODULATION

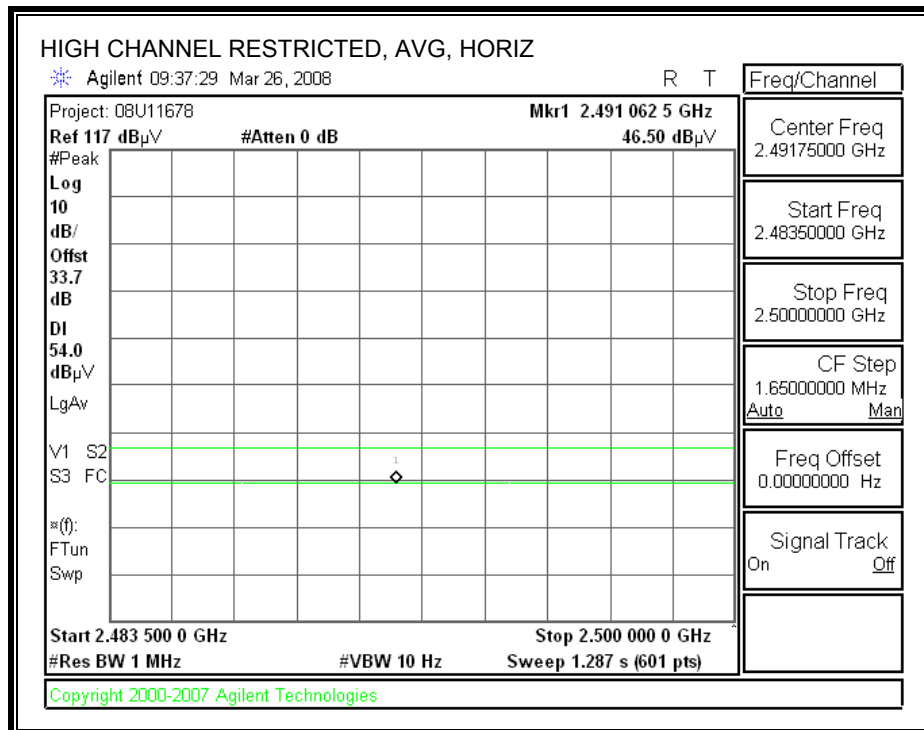
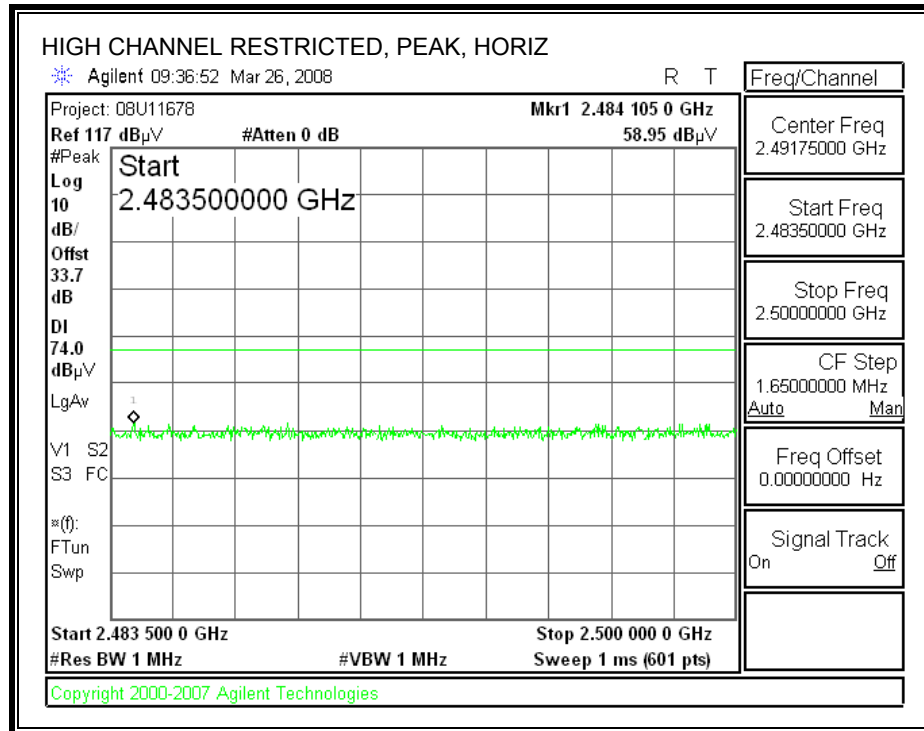
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



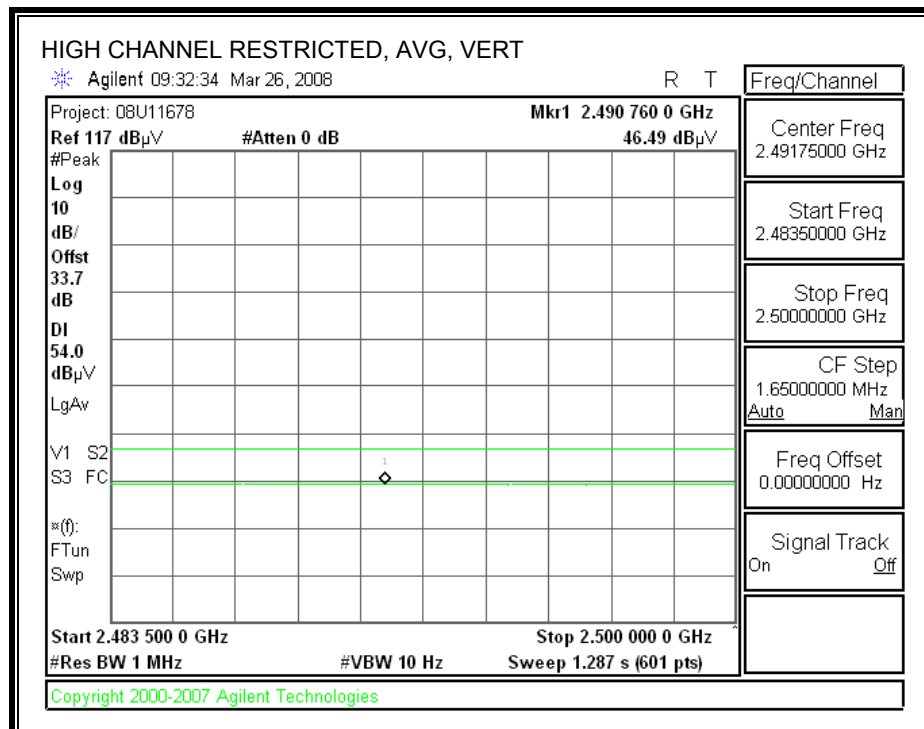
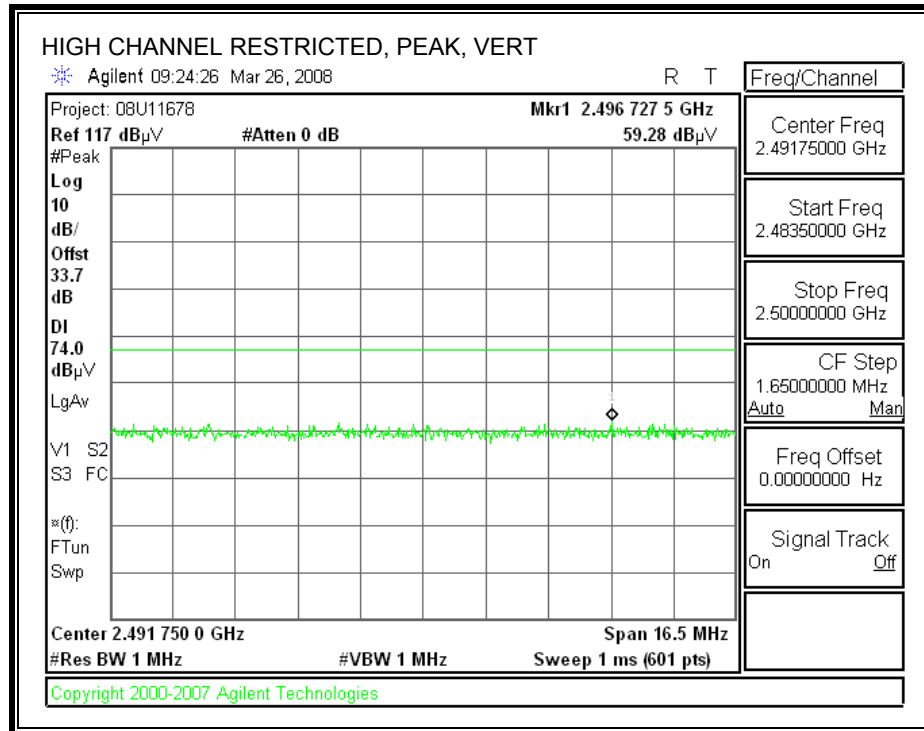
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HARMONICS AND SPURIOUS EMISSIONS – 8PSK MODE

High Frequency Measurement																																													
Compliance Certification Services, Fremont 3m Chamber																																													
Company:		Broadcom																																											
Project #:		08U11678																																											
Date:		3/27/2008																																											
Test Engineer:		Vien Tran																																											
Configuration:		EUT / Laptop																																											
Mode:		Tx 8PSK Mode																																											
Test Equipment:																																													
Horn 1-18GHz		Pre-amplifier 1-26GHz		Pre-amplifier 26-40GHz		Horn > 18GHz				Limit																																			
T120; S/N: 29310 @3m		T145 Agilent 3008A0050								FCC 15.205																																			
Hi Frequency Cables																																													
2 foot cable		3 foot cable		12 foot cable		HPF		Reject Filter		<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz																																			
		Ninous 202575001		Can 187209002		HPF_4.0GHz																																							
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)																														
LOW CHANNEL, 2402 MHz																																													
4.804	3.0	42.9	31.6	33.7	3.7	-34.8	0.0	0.6	46.0	34.7	74	54	-28.0	-19.3	V																														
4.804	3.0	43.8	32.7	33.7	3.7	-34.8	0.0	0.6	46.9	35.8	74	54	-27.1	-18.2	H																														
MID CHANNEL, 2441 MHz																																													
4.882	3.0	43.2	32.3	33.8	3.7	-34.9	0.0	0.6	46.4	35.5	74	54	-27.6	-18.5	V																														
4.882	3.0	44.5	33.6	33.8	3.7	-34.9	0.0	0.6	47.7	36.8	74	54	-26.3	-17.2	H																														
HI CHANNEL, 2480 MHz																																													
4.960	3.0	42.3	31.3	33.8	3.7	-34.9	0.0	0.6	45.6	34.6	74	54	-28.4	-19.4	V																														
4.960	3.0	43.4	32.5	33.8	3.7	-34.9	0.0	0.6	46.7	35.8	74	54	-27.3	-18.2	H																														
No other emissions were detected above system noise floor.																																													
<table style="width: 100%; border: none;"> <tr> <td>f</td> <td>Measurement Frequency</td> <td>Amp</td> <td>Preamp Gain</td> <td>Avg Lim</td> <td>Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> </tr> </table>																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		
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. RECEIVER ABOVE 1 GHz

High Frequency Measurement																	
Compliance Certification Services, Fremont 3m Chamber																	
Company:		Broadcom															
Project #:		08U11678															
Date:		3/27/2008															
Test Engineer:		Vien Tran															
Configuration:		EUT / Laptop															
Mode:		Rx Mode															
Test Equipment:																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz				Limit	
T120; S/N: 29310 @3m				T145 Agilent 3008A0050												RX RSS 210	
Hi Frequency Cables																	
2 foot cable				3 foot cable				12 foot cable				HPF		Reject Filter		<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz	
				Ninous 202575001				Can 187209002									
f GHz	Dist (m)	Read Pk dBuV	Read Avg dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filt dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)		
1.330	3.0	59.3	42.1	29.1	2.3	-35.9	0.0	0.0	54.8	37.6	74	54	-19.2	-16.4	V		
1.607	3.0	57.7	41.7	30.1	2.5	-35.7	0.0	0.0	54.6	38.6	74	54	-19.4	-15.4	V		
2.009	3.0	54.5	40.3	31.6	2.7	-35.4	0.0	0.0	53.4	39.2	74	54	-20.6	-14.8	V		
4.500	3.0	48.5	42.3	33.4	3.6	-34.8	0.0	0.0	50.7	44.5	74	54	-23.3	-9.5	V		
1.330	3.0	57.0	41.6	29.1	2.3	-35.9	0.0	0.0	52.5	37.1	74	54	-21.5	-16.9	H		
1.607	3.0	56.9	40.7	30.1	2.5	-35.7	0.0	0.0	53.8	37.6	74	54	-20.2	-16.4	H		
2.009	3.0	52.7	38.8	31.6	2.7	-35.4	0.0	0.0	51.6	37.7	74	54	-22.4	-16.3	H		
4.500	3.0	47.4	41.5	33.4	3.6	-34.8	0.0	0.0	49.6	43.7	74	54	-24.4	-10.3	H		
No other emissions were detected above system noise floor.																	
f	Measurement Frequency					Amp	Preamp Gain					Avg Lim	Average Field Strength Limit				
Dist	Distance to Antenna					D Corr	Distance Correct to 3 meters					Pk Lim	Peak Field Strength Limit				
Read	Analyzer Reading					Avg	Average Field Strength @ 3 m					Avg Mar	Margin vs. Average Limit				
AF	Antenna Factor					Peak	Calculated Peak Field Strength					Pk Mar	Margin vs. Peak Limit				
CL	Cable Loss					HPF	High Pass Filter										

8.3. WORST-CASE BELOW 1 GHz

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



Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 37 File#: 08U11678_15B.EMI Date: 03-27-2008 Time: 11:51:29

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Vien tran
Project #: : 08U11678
Company: : Broadcom
Configuration:: EUT / Test JIG / Laptop
Mode : : Tx worst-case
Target: : CISPR Class B
: FCC class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	124.090	47.81	-16.52	31.29	43.50	-12.21	Peak
2	315.180	54.82	-15.27	39.55	46.00	-6.45	Peak
3	438.370	45.35	-12.54	32.81	46.00	-13.19	Peak
4	761.380	42.27	-7.44	34.83	46.00	-11.17	Peak
5	960.230	37.90	-3.73	34.17	54.00	-19.83	Peak

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



Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 43 File#: 08U11678_15B.EMI Date: 03-27-2008 Time: 13:08:46

Condition: FCC CLASS-B VERTICAL
Test Operator:: Vien tran
Project #: : 08U11678
Company: : Broadcom
Configuration:: EUT / Test JIG / Laptop
Mode : : Tx worst-case
Target: : CISPR Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	31.940	45.45	-10.01	35.44	40.00	-4.56	Peak
2	99.840	56.50	-20.75	35.75	43.50	-7.75	Peak
3	230.790	53.62	-18.40	35.22	46.00	-10.78	Peak
4	290.930	49.92	-16.14	33.78	46.00	-12.22	Peak
5	984.480	35.63	-3.09	32.54	54.00	-21.46	Peak

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

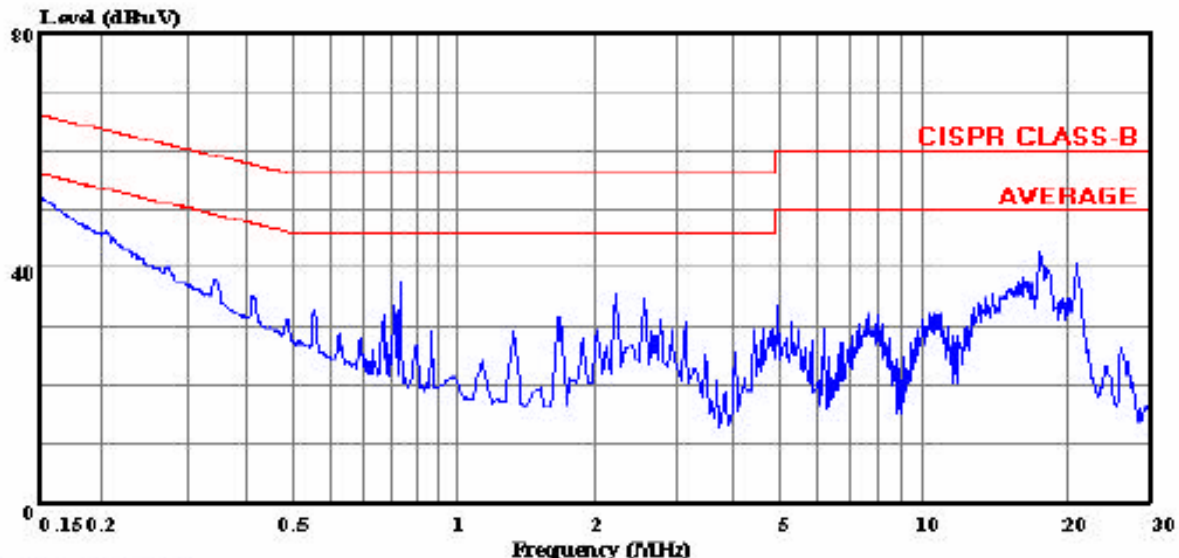
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	52.10	--	--	0.00	66.00	56.00	-13.90	-3.90	L1
0.83	37.65	--	--	0.00	56.00	46.00	-18.35	-8.35	L1
17.57	42.52	--	--	0.00	60.00	50.00	-17.48	-7.48	L1
0.15	49.54	--	--	0.00	66.00	56.00	-16.46	-6.46	L2
0.56	40.18	--	--	0.00	56.00	46.00	-15.82	-5.82	L2
20.92	39.75	--	--	0.00	60.00	50.00	-20.25	-10.25	L2
6 Worst Data									

LINE 1 RESULTS



Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 7 File#: 08U11678 LC.EMI Date: 03-31-2008 Time: 08:48:59



(Line Conduction)

Trace:

Ref Trace:

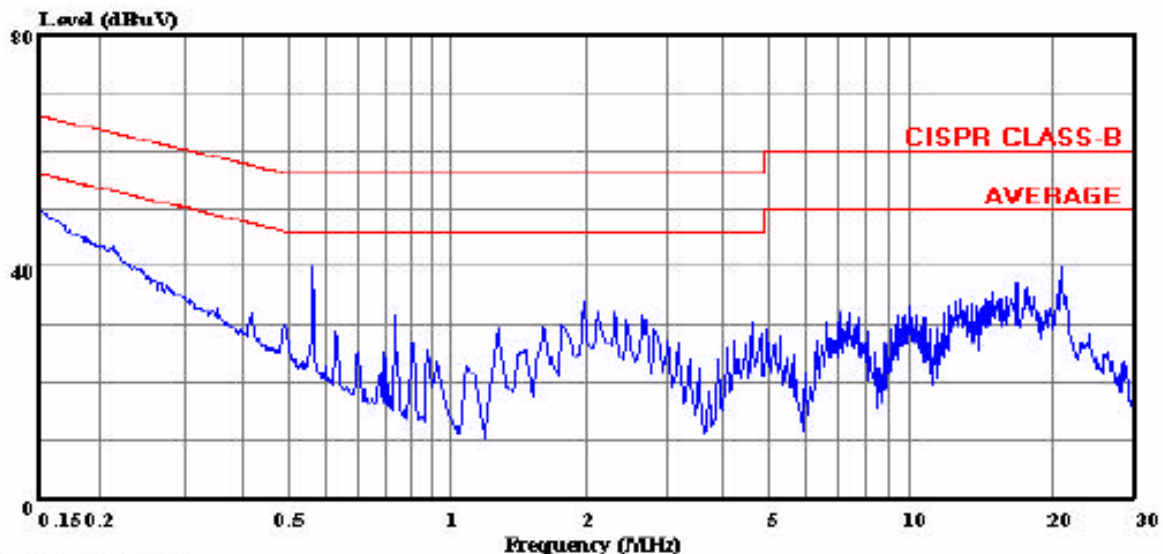
Condition: CISPR CLASS-B
Test Operator:: Vien Tran
Project #: 08U11678
Company: Broadcom
Configuration:: BUT & Support Equipments
Mode: Normal
Target: FCC Class B
Voltage: 115VAC / 60Hz
Line 1: Peak (Blue)

LINE 2 RESULTS



Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 23 File#: 08U11678 LC.BMI Date: 03-31-2008 Time: 09:23:26



(Line Conduction)

Trace:

Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Vien Tran
Project #: 08U11678
Company: Broadcom
Configuration:: EUT & Support Equipments
Mode: Normal
Target: FCC Class B
Voltage: 115VAC / 60Hz
: Line 2: Peak (Blue)

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 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	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* 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).

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Rearranging terms to calculate the power density at a specific distance yields

$$S = 0.0795 * 10^{((P + G) / 10)} / (d^2)$$

The power density in units of mW/cm² is converted to units of W/m² by multiplying by a factor of 10.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of $S = 1.0 \text{ mW/cm}^2$

From IC Safety Code 6, Section 2.2 Table 5 Column 4, $S = 10 \text{ W/m}^2$

RESULTS

(MPE distance equals 20 cm)

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm ²)	IC Power Density (W/m ²)
GFSK	2.4 GHz	20.0	2.49	-1.71	0.0002	0.00
8PSK	2.4 GHz	20.0	4.23	-1.71	0.0004	0.00