FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

BLUETOOTH TRANSCEIVER MODULE

MODEL NUMBER: BCM92070MD_LENO

FCC ID: QDS-BRCM1046LE

REPORT NUMBER: 11U13947-3, Revision A

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/02/11	Initial Issue	F. Ibrahim
A	08/04/11	Updated GFSK data table	D. Garcia

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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: BCM92070MD_LENO

SERIAL NUMBER: 39 V005 and V005

DATE TESTED: JULY 21 to AUGUST 1, 2011

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	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:

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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 and FCC CFR 47 Part 15.

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:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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 module with Low Energy mode.

The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBM)	Output Power (mW)
2402-2480	Basic GFSK	2.11	1.63
2402-2480	Enhanced 8PSK	4.74	2.98

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a permanently attached PCB antenna, with a maximum peak gain of 0.48 dBi.

5.4. SOFTWARE AND FIRMWARE

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

The test utility software used during testing was Bluetool, ver. 1.4.6.7.

5.5. WORST-CASE CONFIGURATION AND MODE

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

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	HP	dv6000	CNF6463KP7	DoC
AC Adapter	HP	PPP009S	57BC30AU4Q709M	DoC
Adapter Board	Broadcom	BCM9USB3P3V	1416738	N/A

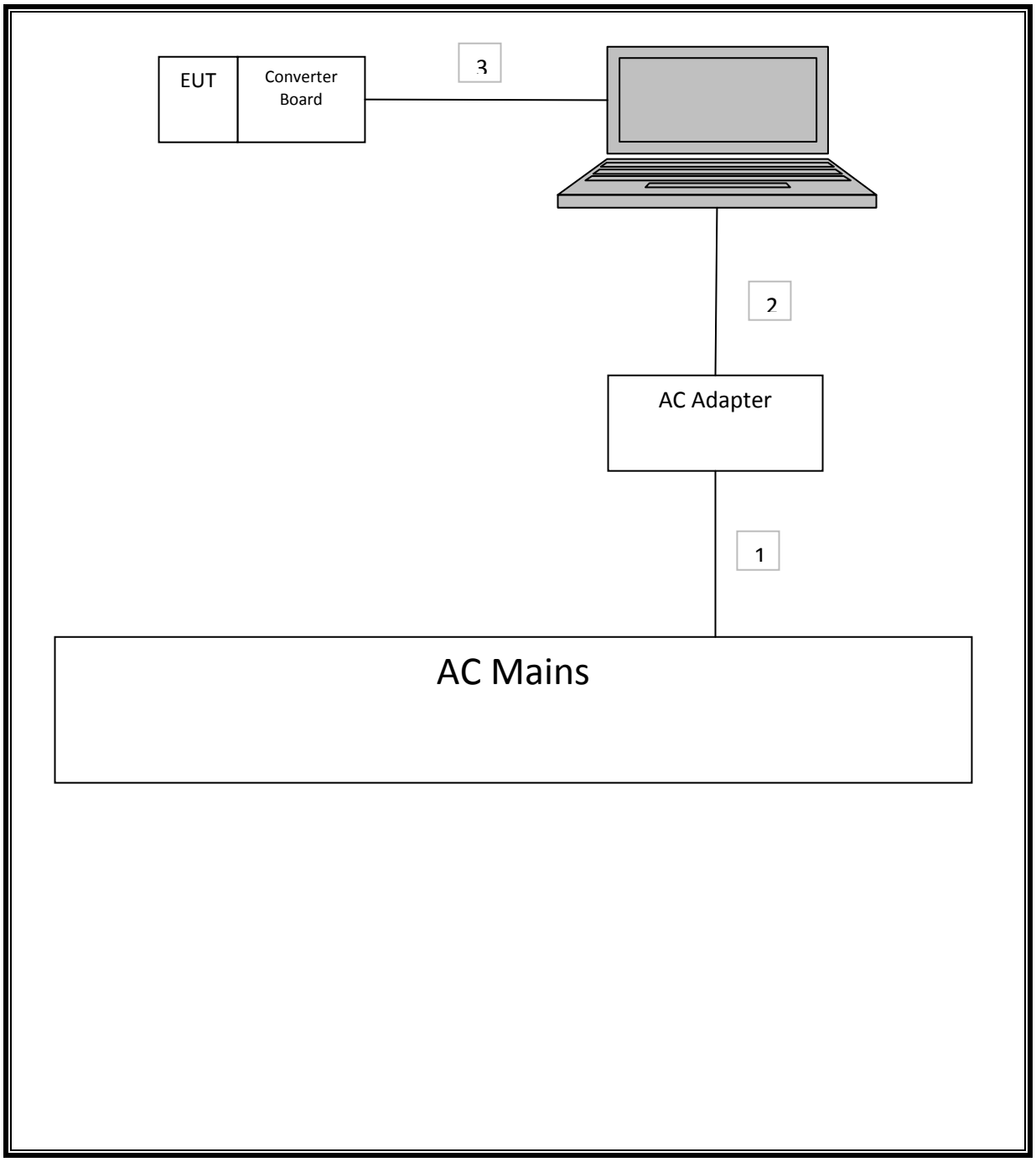
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Unshielded	1.8m	
2	DC	1	DC	Unshielded	1.8m	
3	USB	1	USB	Shielded	1.5m	Molded ferrite on EUT end

TEST SETUP

The EUT is connected to a host laptop computer via a USB cable and a conversion board during the test. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01176	08/10/11
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01159	05/11/12
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01171	07/16/12
Antenna, Horn, 18 GHz	EMCO	3115	C00872	06/29/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00558	01/27/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	07/18/12
EMI Test Receiver, 9 kHz-7 GHz	R & S	ESCI 7	1000741	07/06/12
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11
Peak Power Meter	Aglient / HP	E4416A	C00963	03/22/12
Peak Power Sensor	Aglient / HP	E9327A	C00964	04/13/12

7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

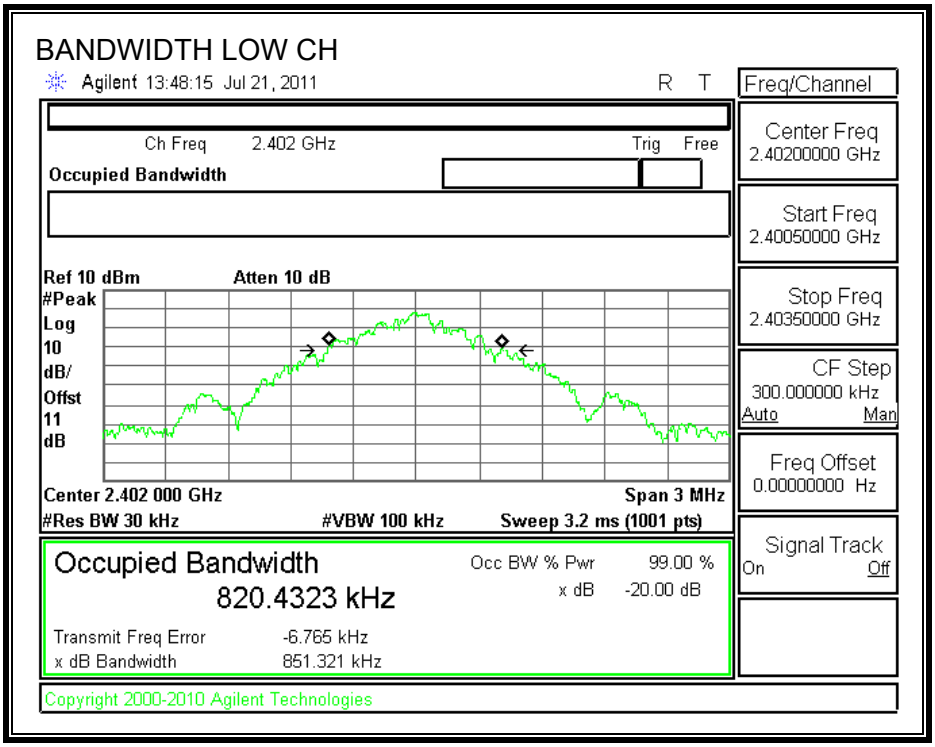
TEST PROCEDURE

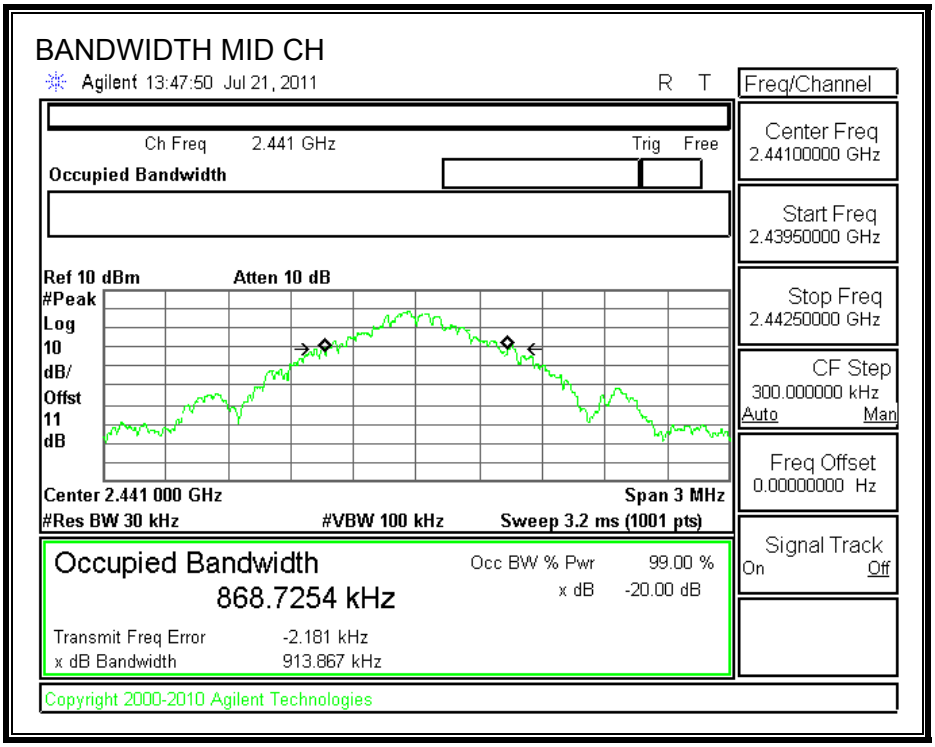
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

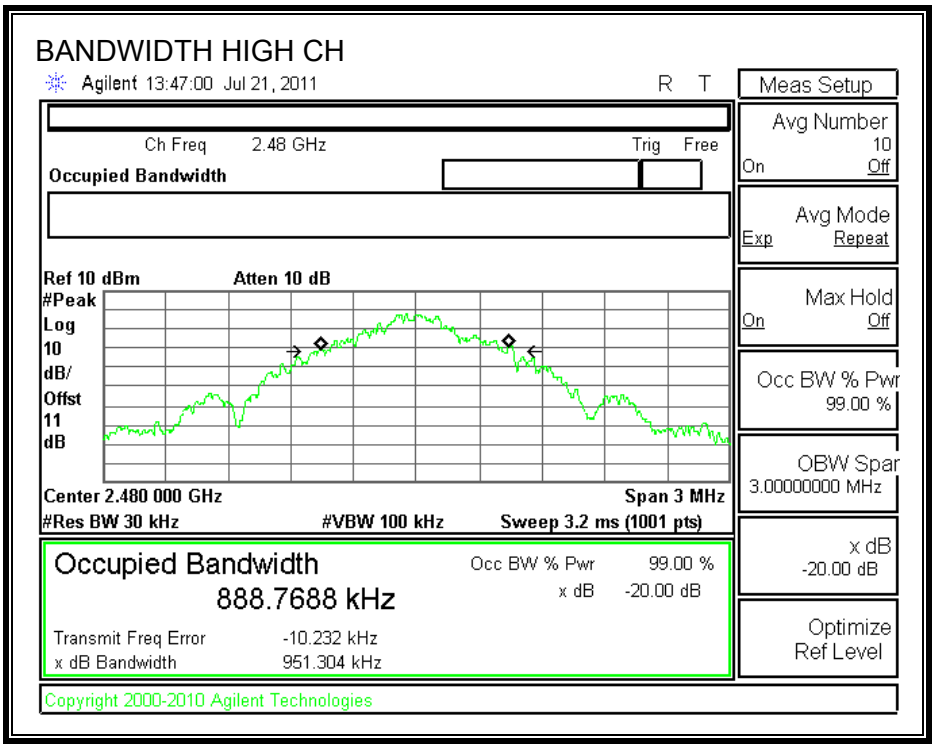
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	851.321
Middle	2441	913.867
High	2480	951.304

20 dB BANDWIDTH







7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

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

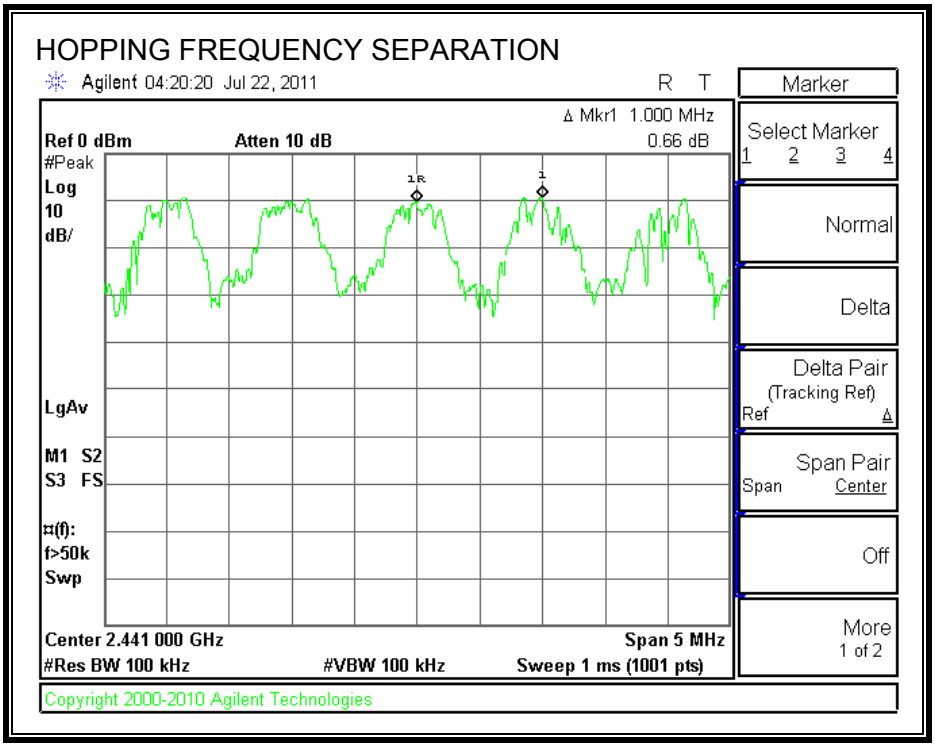
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

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

TEST PROCEDURE

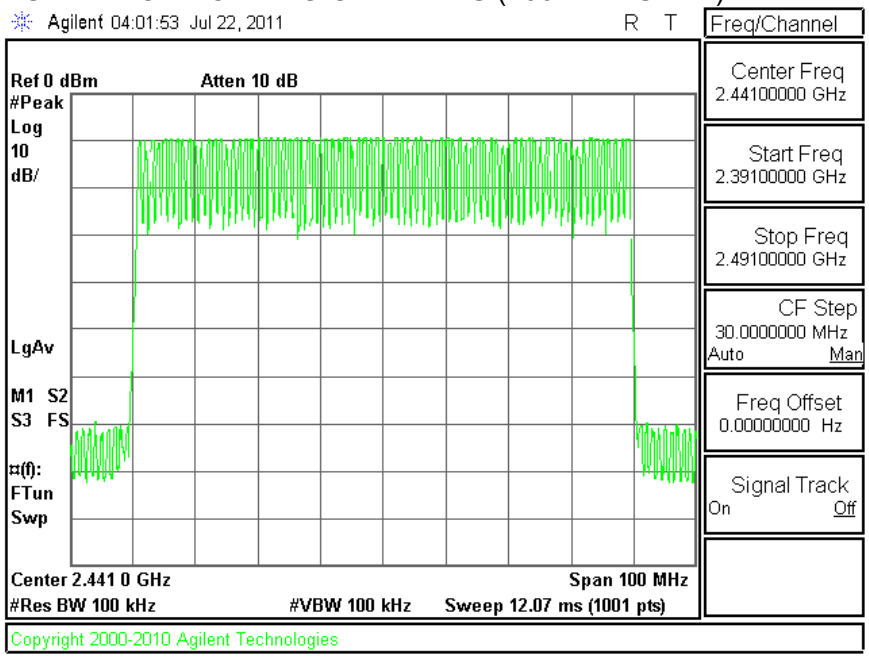
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

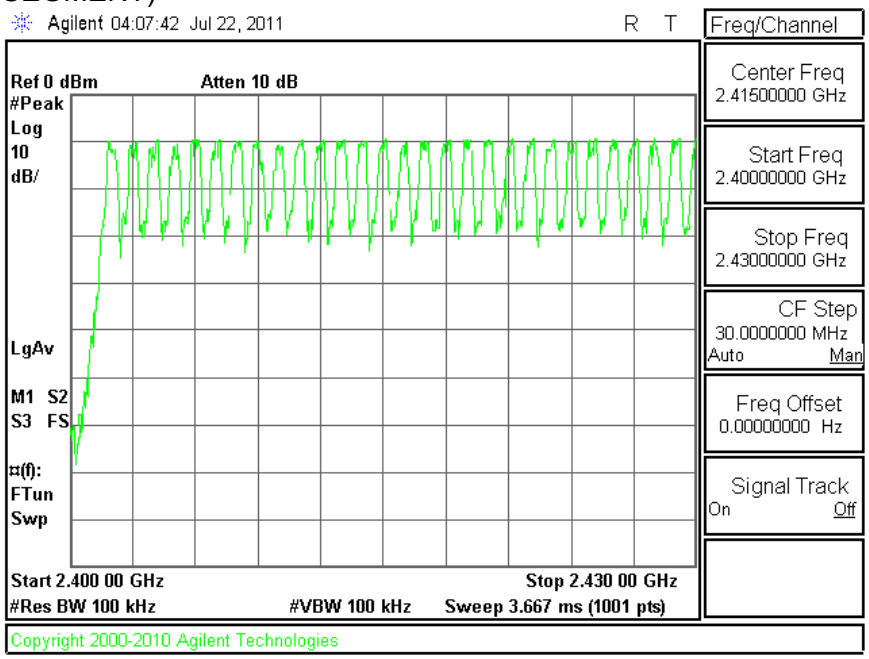
79 Channels observed.

NUMBER OF HOPPING CHANNELS

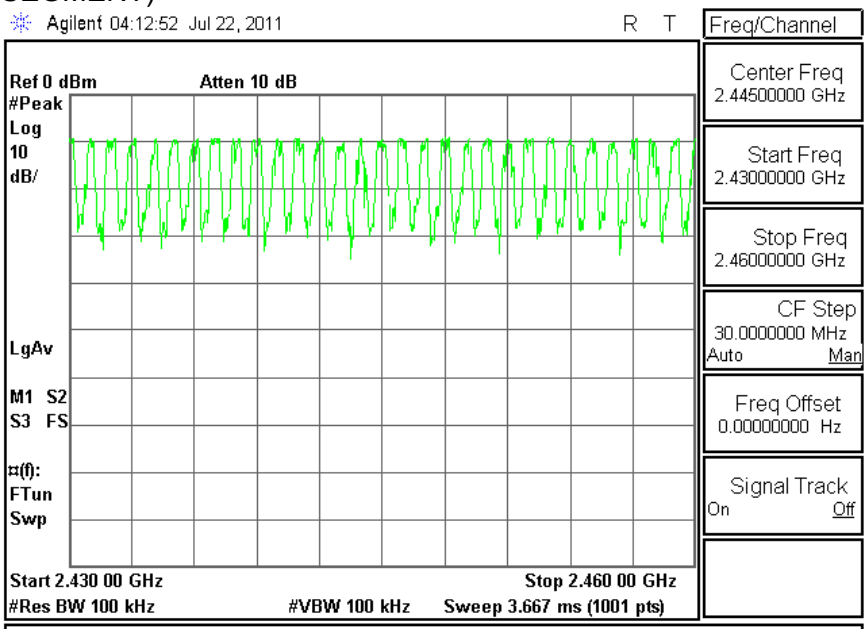
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



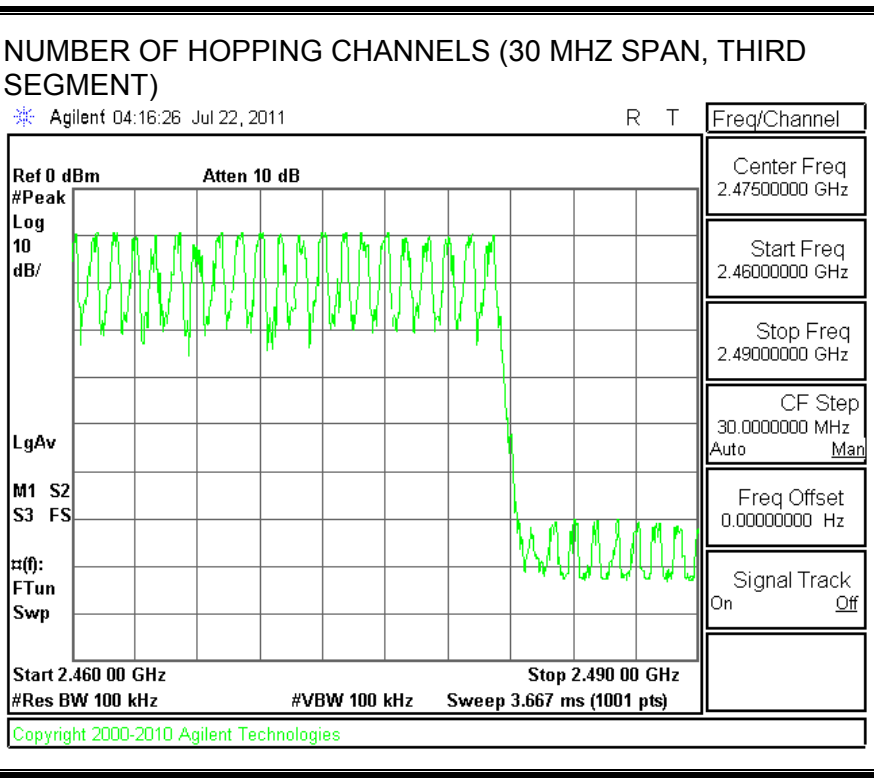
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



7.1.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

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.

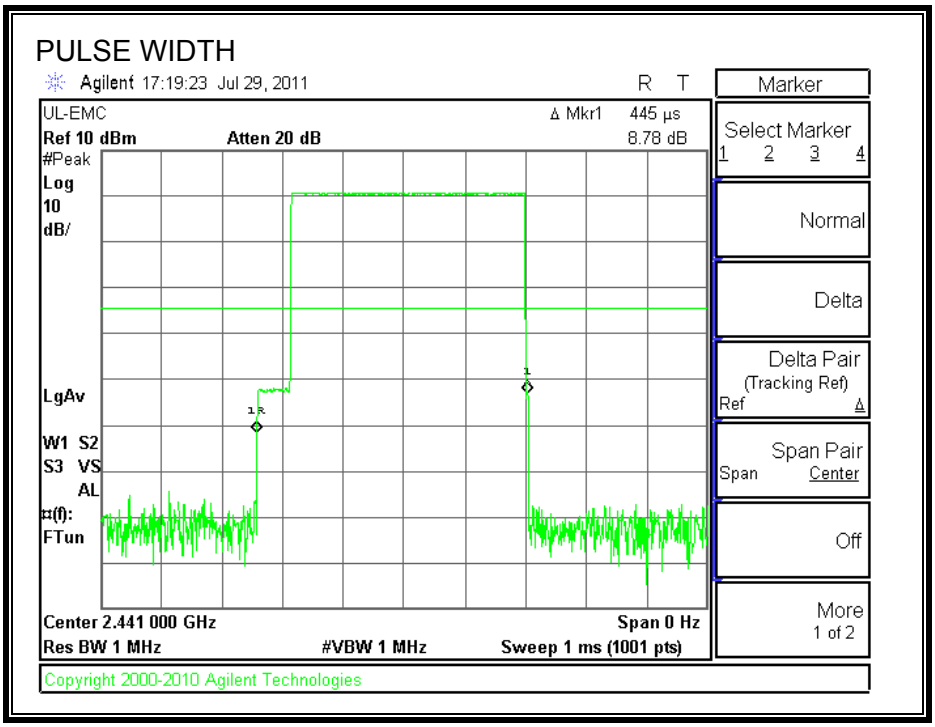
RESULTS

GFSK Mode

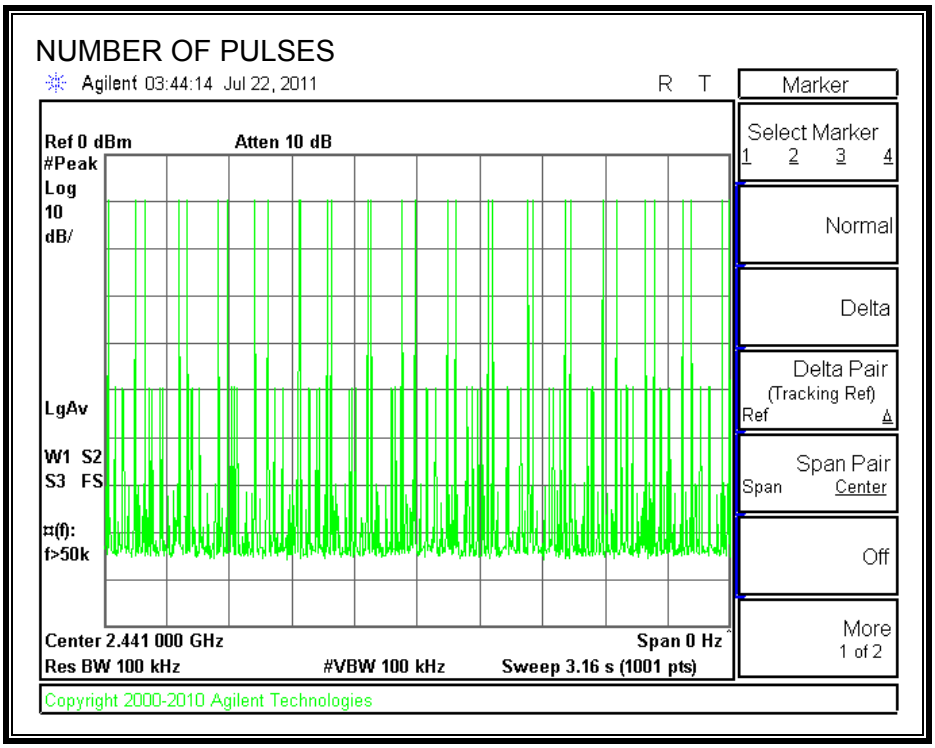
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.445	32	0.142	0.4	0.258
DH3	1.7	19	0.323	0.4	0.077
DH5	2.95	9	0.266	0.4	0.135

DH1

PULSE WIDTH

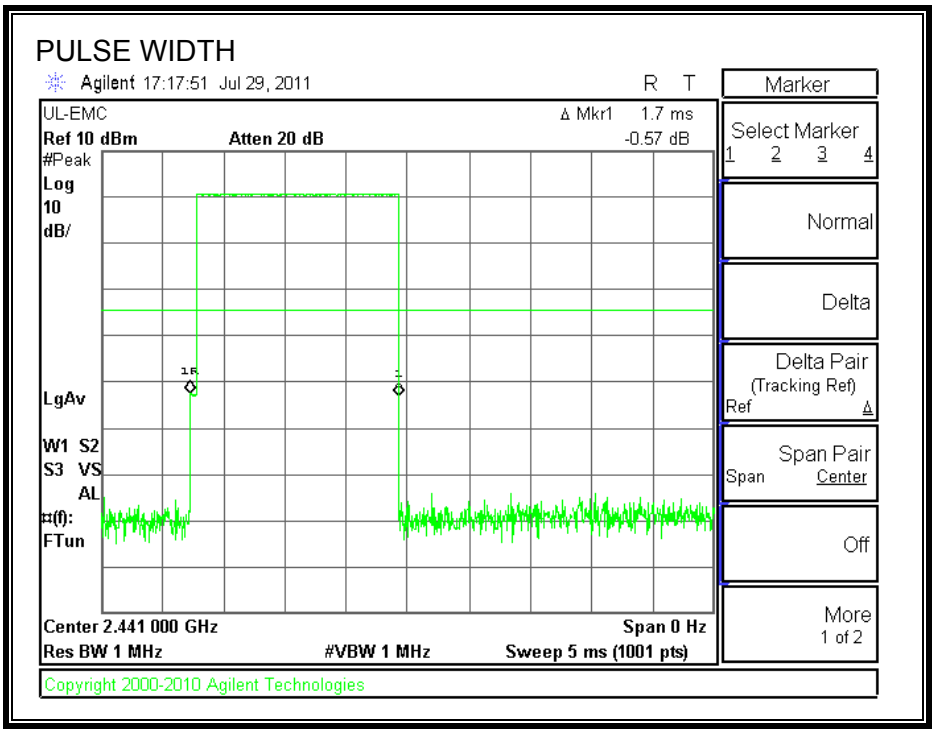


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

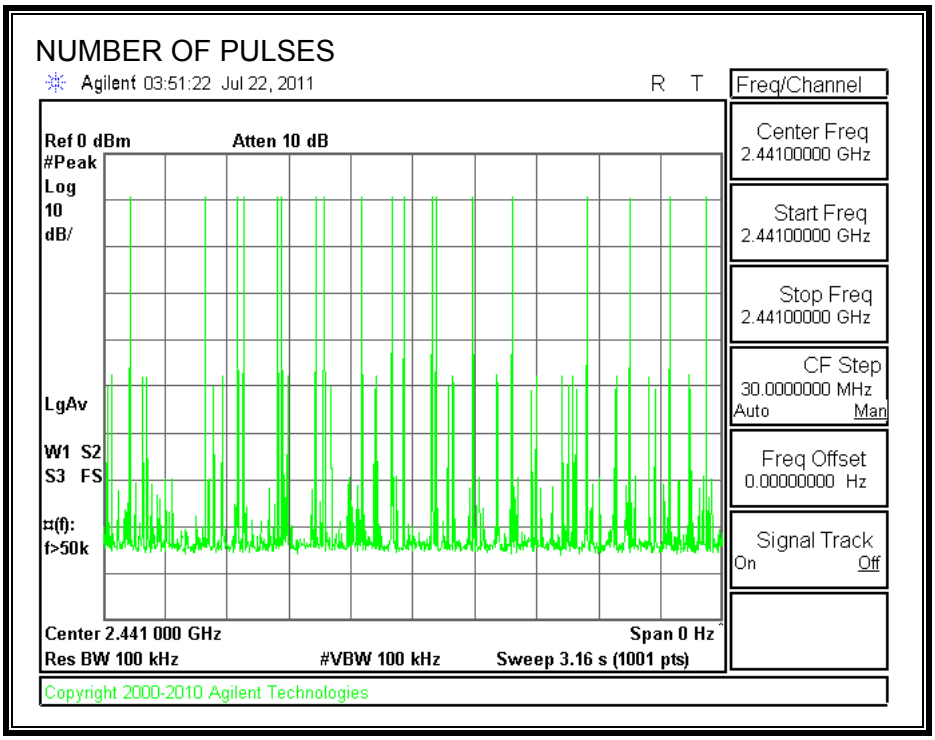


DH3

PULSE WIDTH

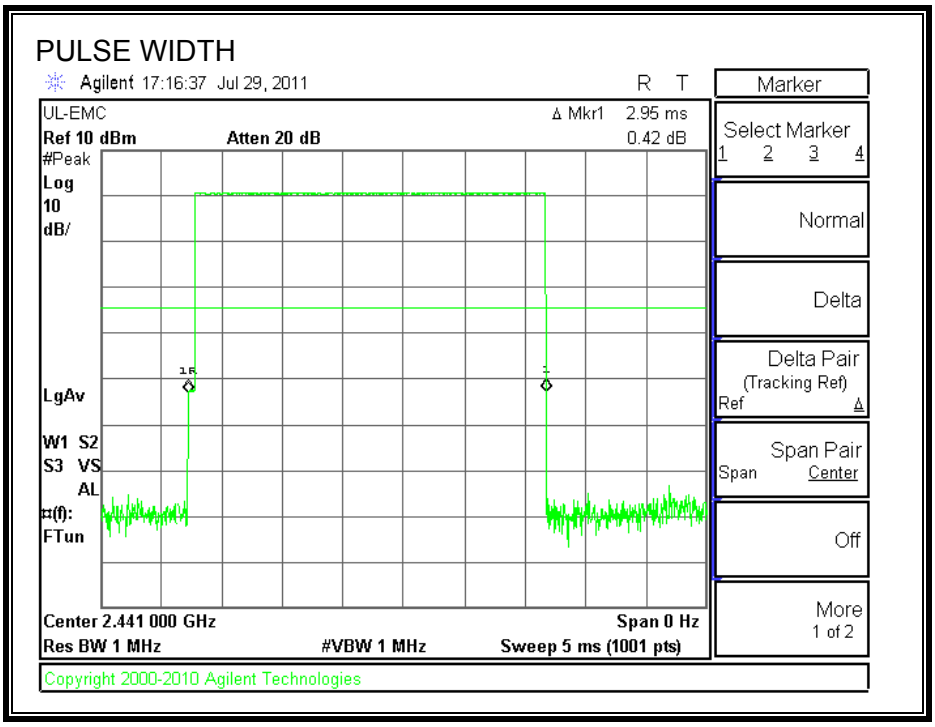


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

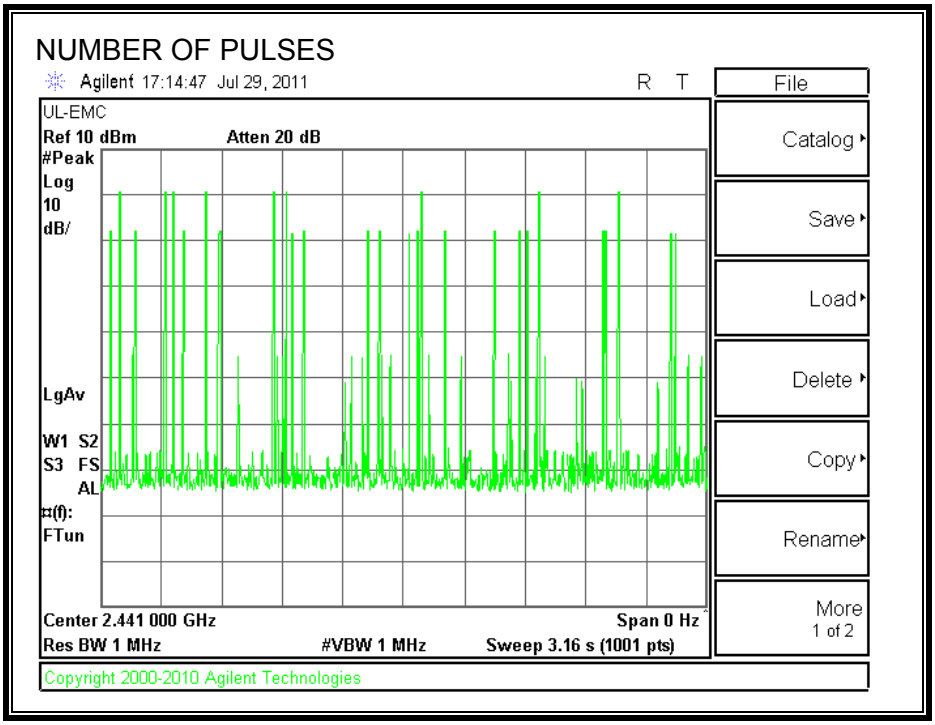


DH5

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.1.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

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

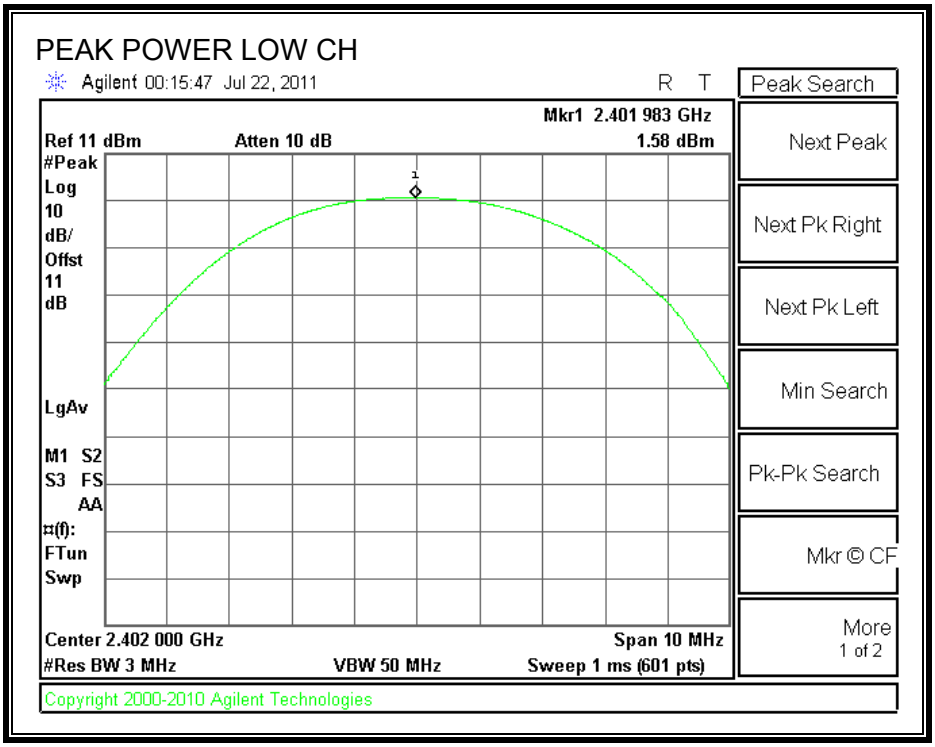
TEST PROCEDURE

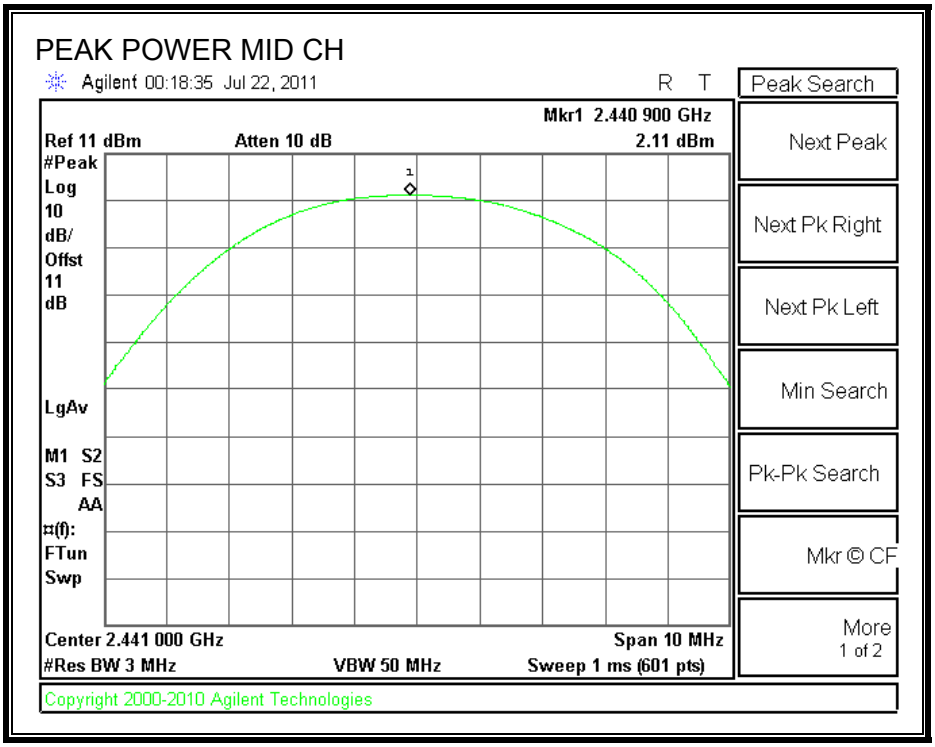
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

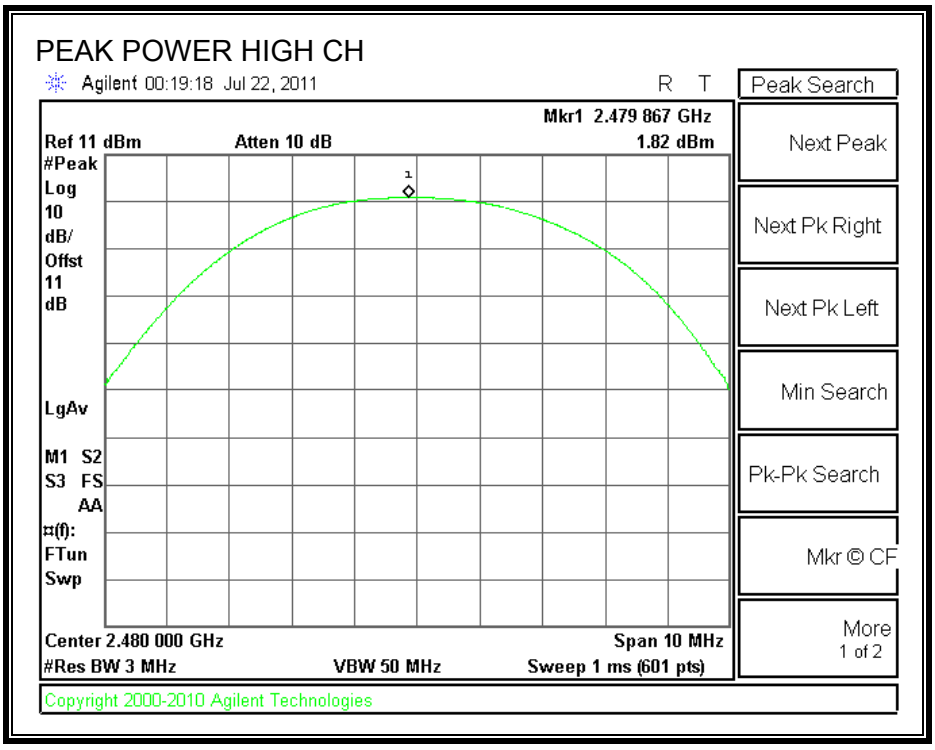
RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	1.58	30	-28.42
Middle	2441	2.11	30	-27.89
High	2480	1.82	30	-28.18

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 11 dB (including 10 dB pad and 1.0 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	0.410
Middle	2441	0.910
High	2480	0.620

7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

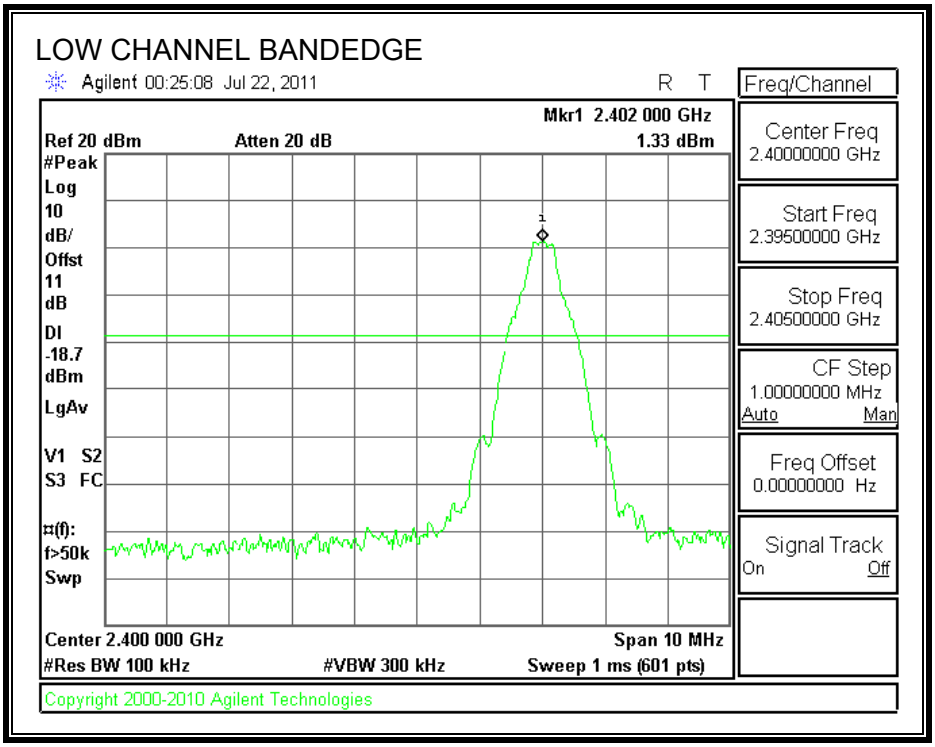
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

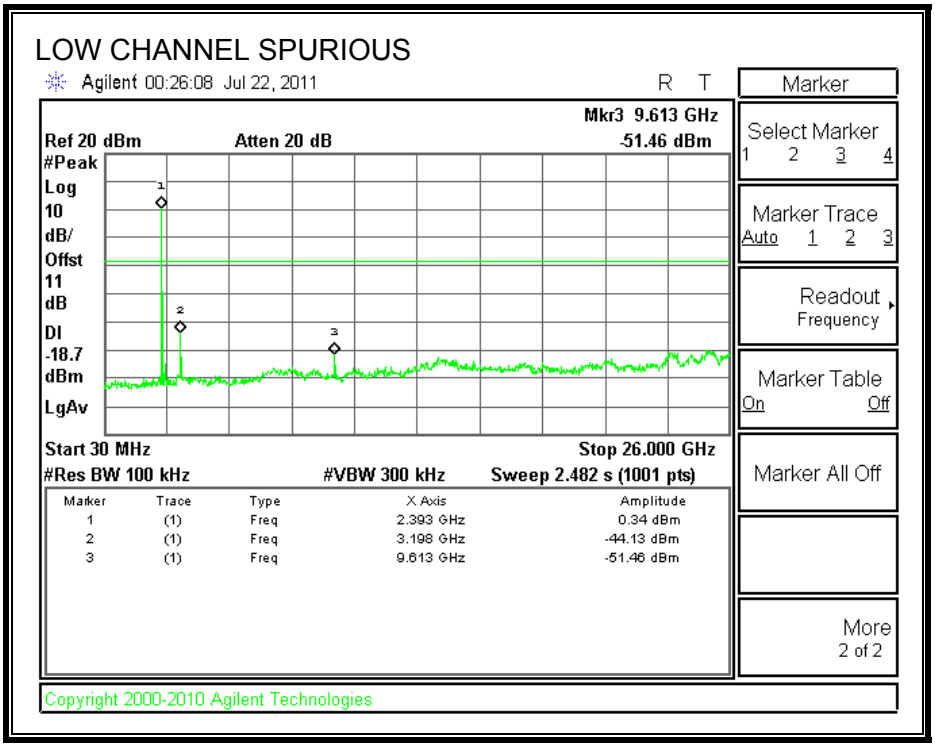
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

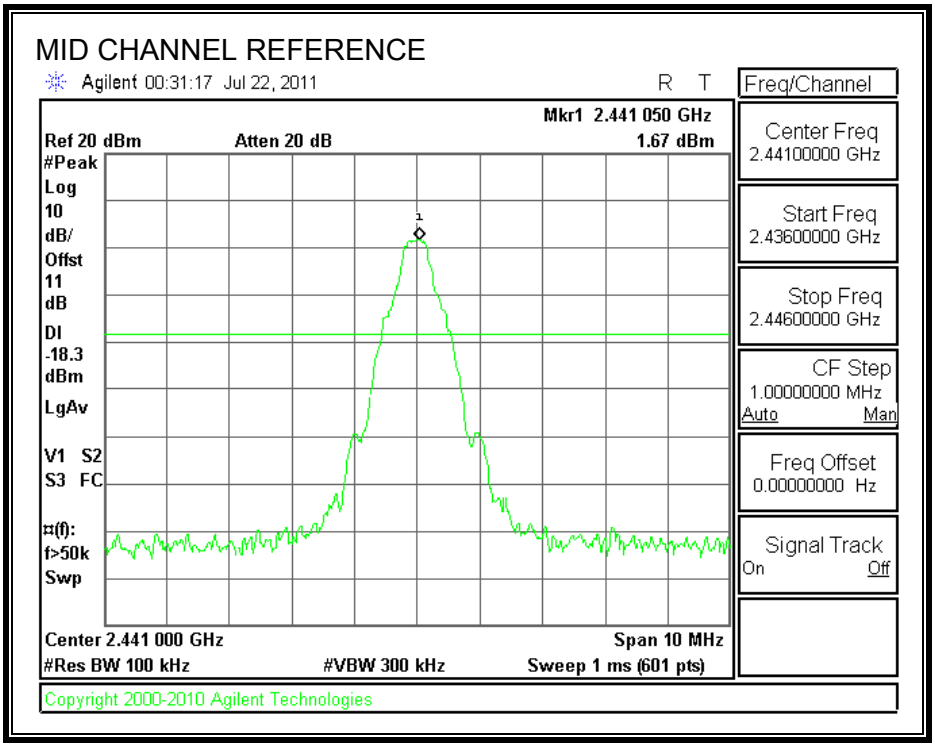
RESULTS

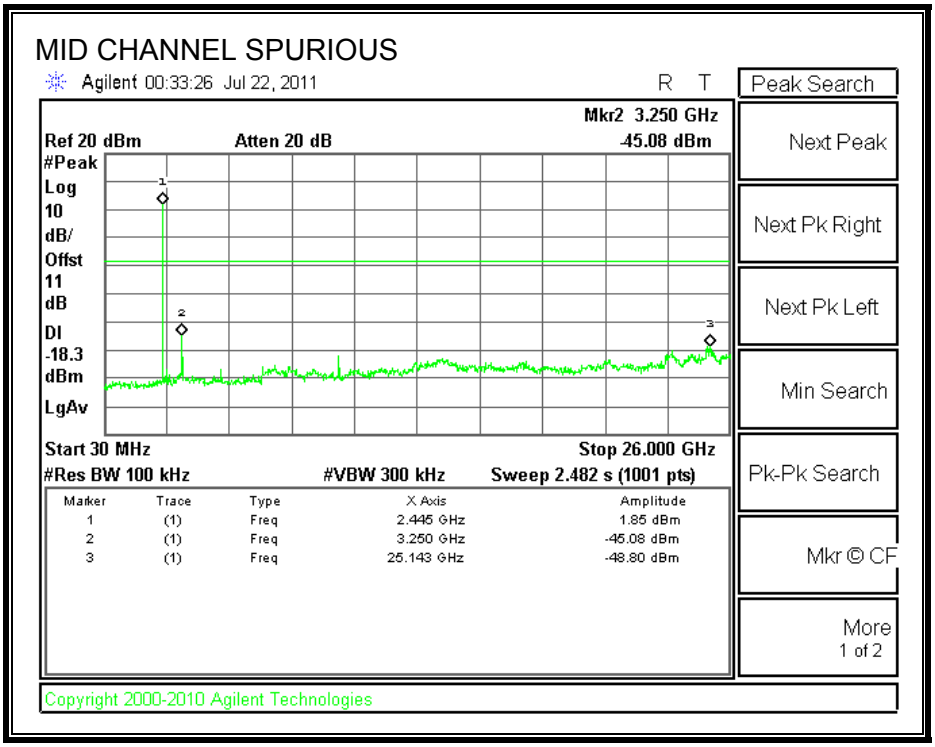
SPURIOUS EMISSIONS, LOW CHANNEL



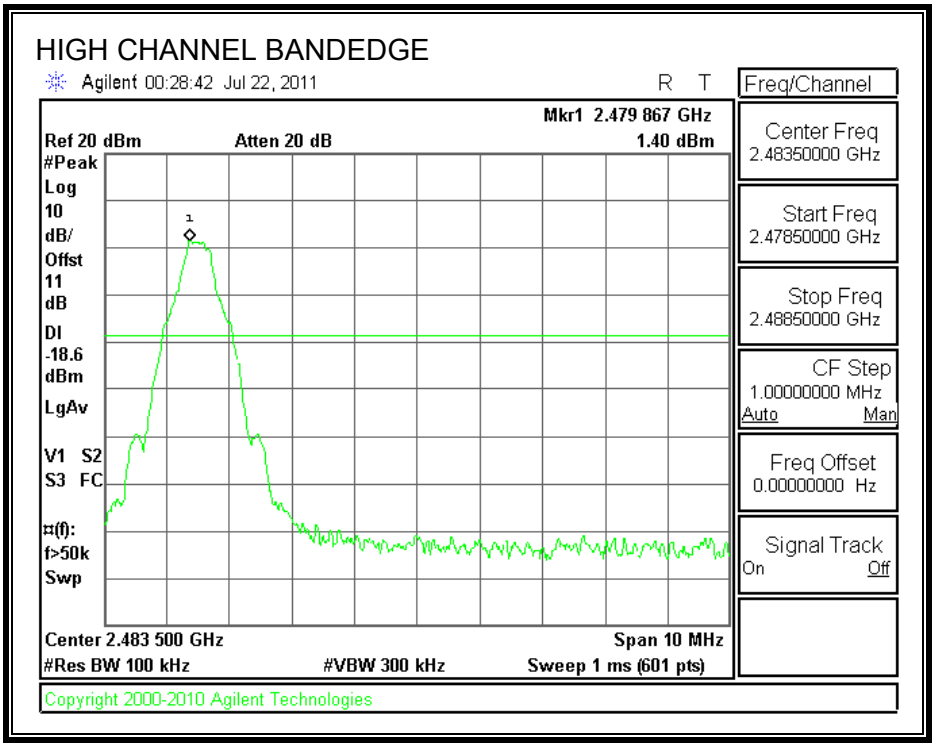


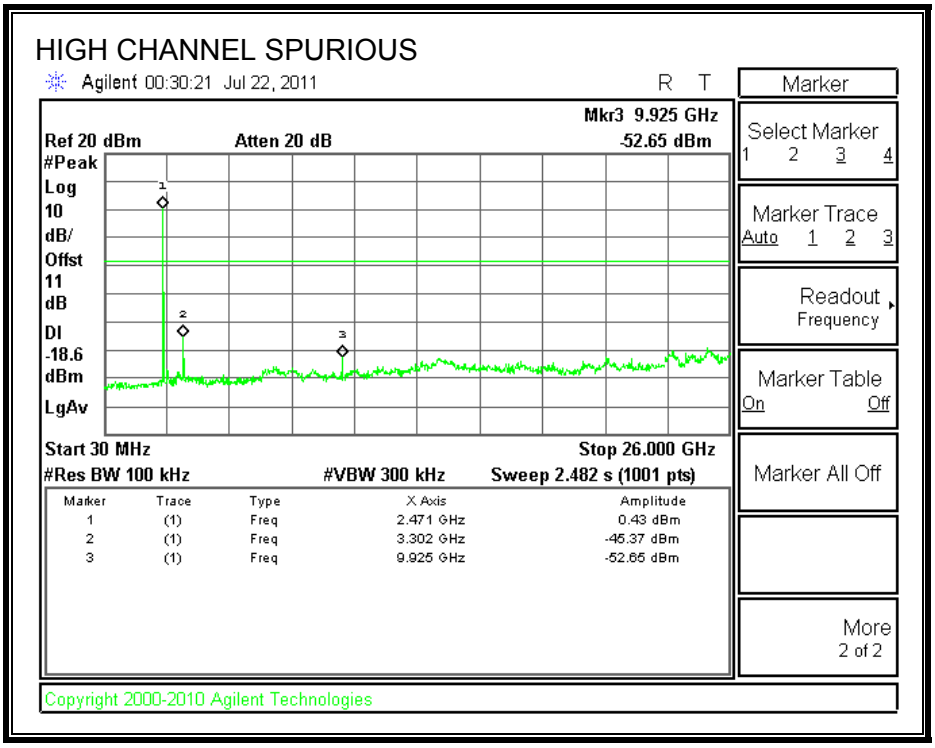
SPURIOUS EMISSIONS, MID CHANNEL





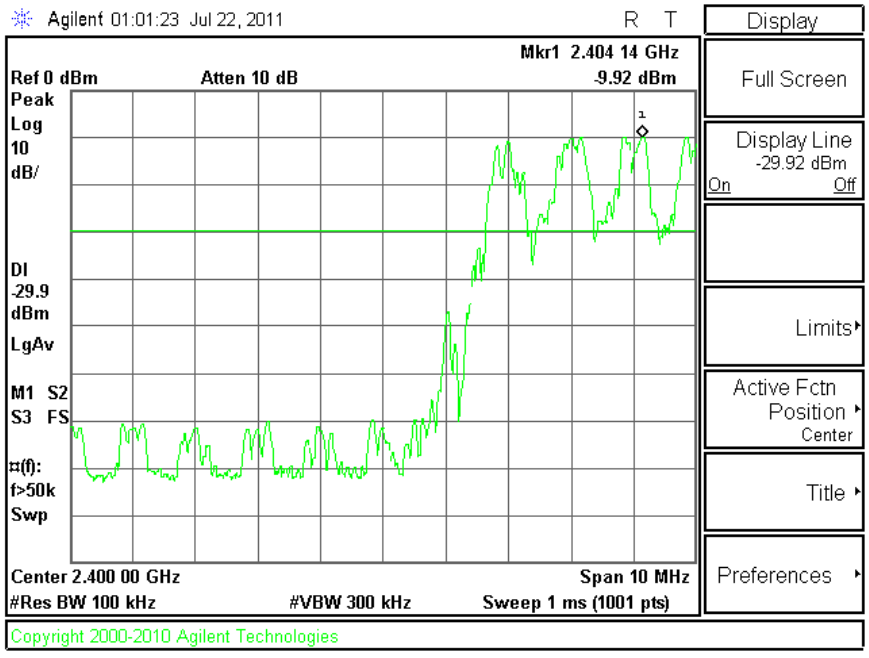
SPURIOUS EMISSIONS, HIGH CHANNEL



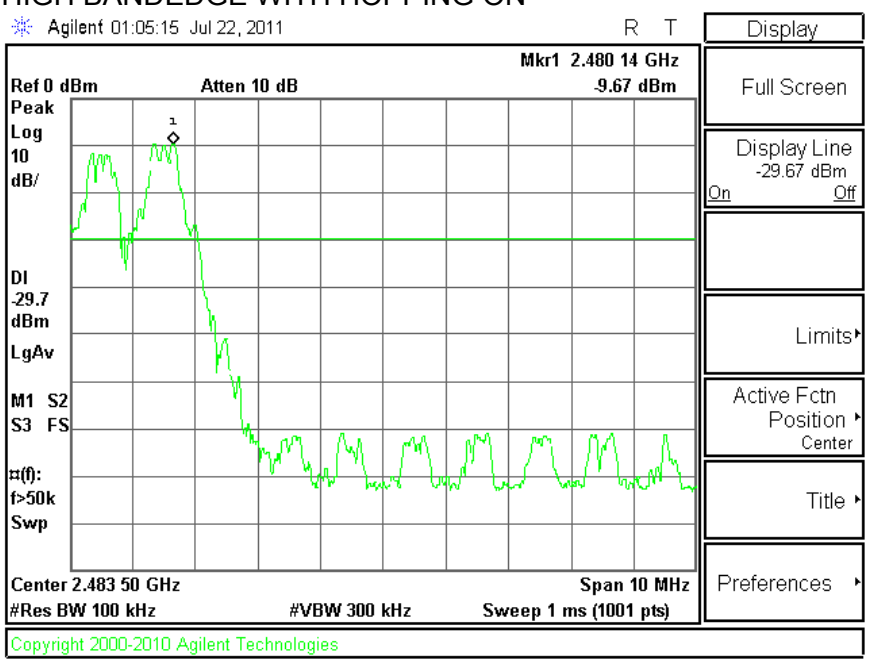


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB BANDWIDTH

LIMIT

None; for reporting purposes only.

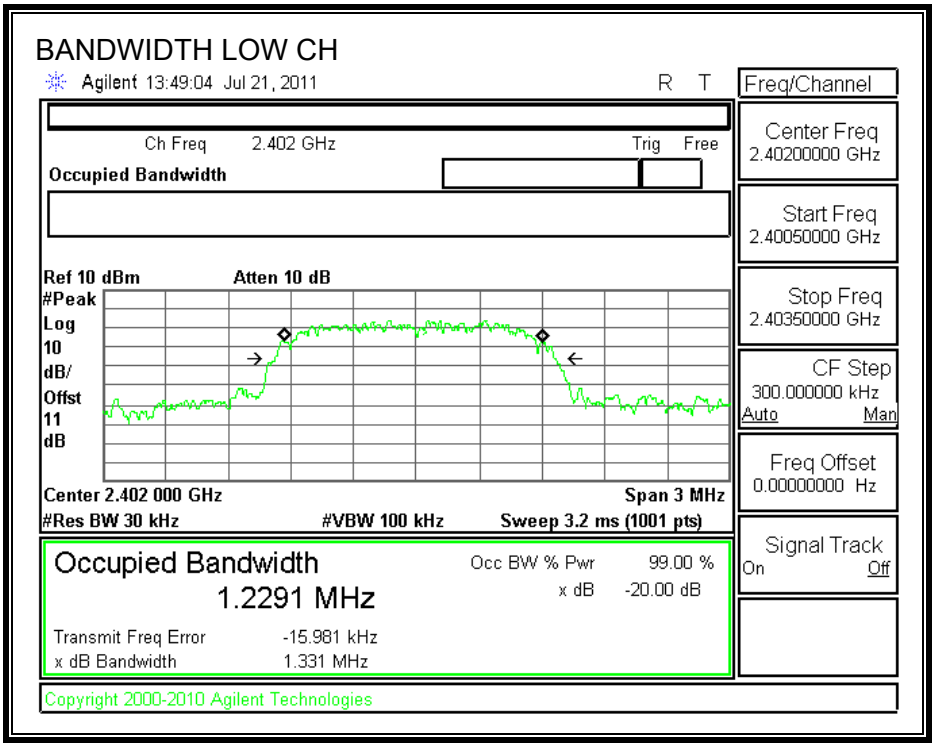
TEST PROCEDURE

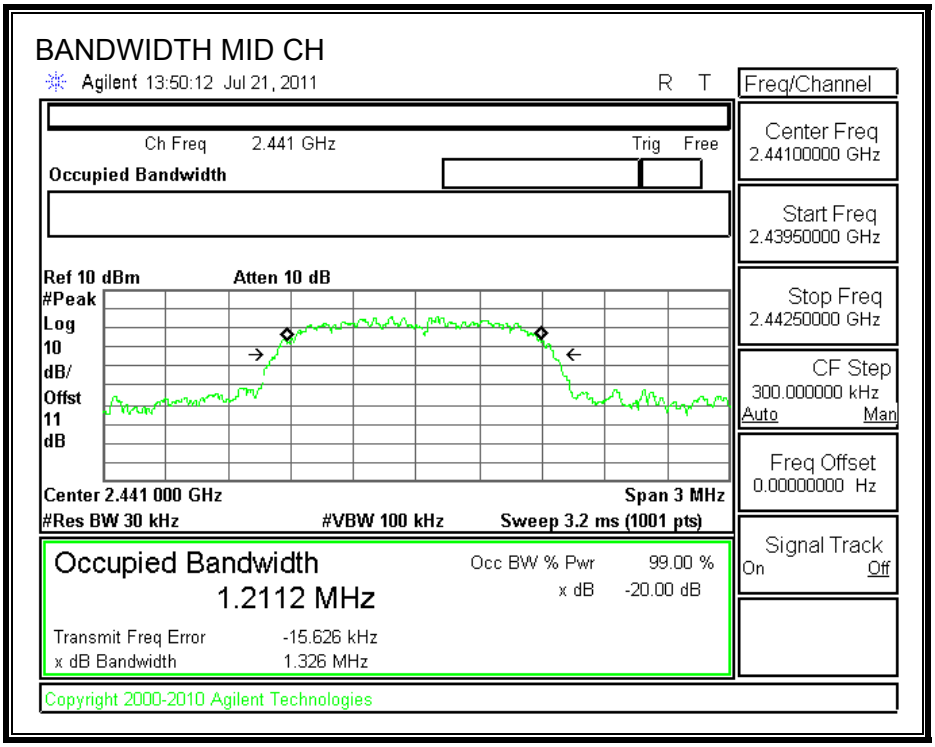
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

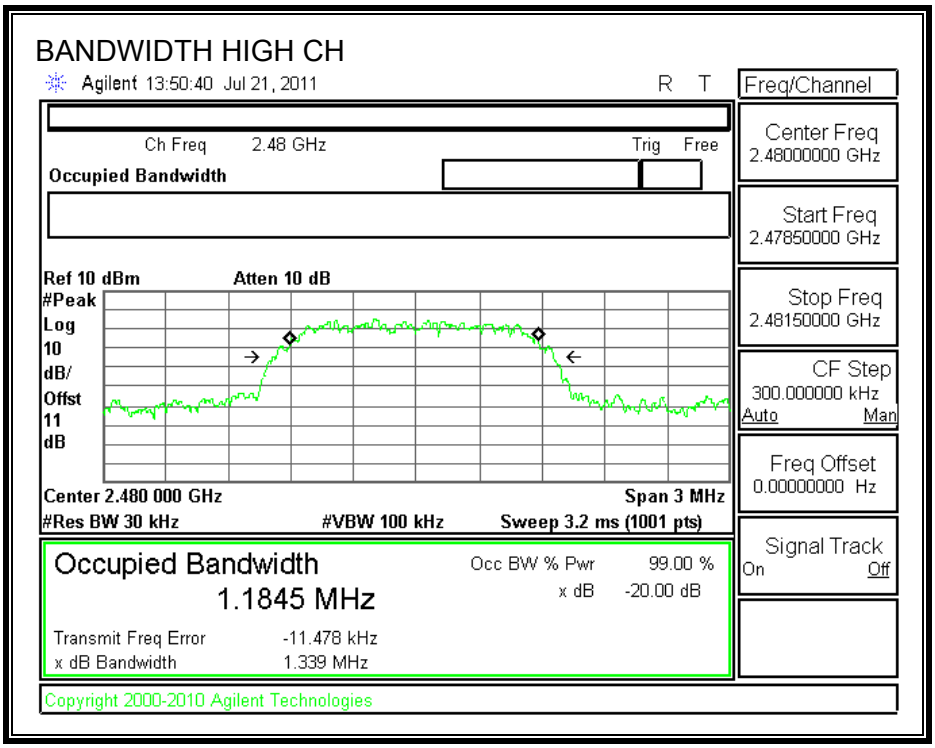
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)
Low	2402	1331
Middle	2441	1326
High	2480	1339

20 dB BANDWIDTH







7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

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

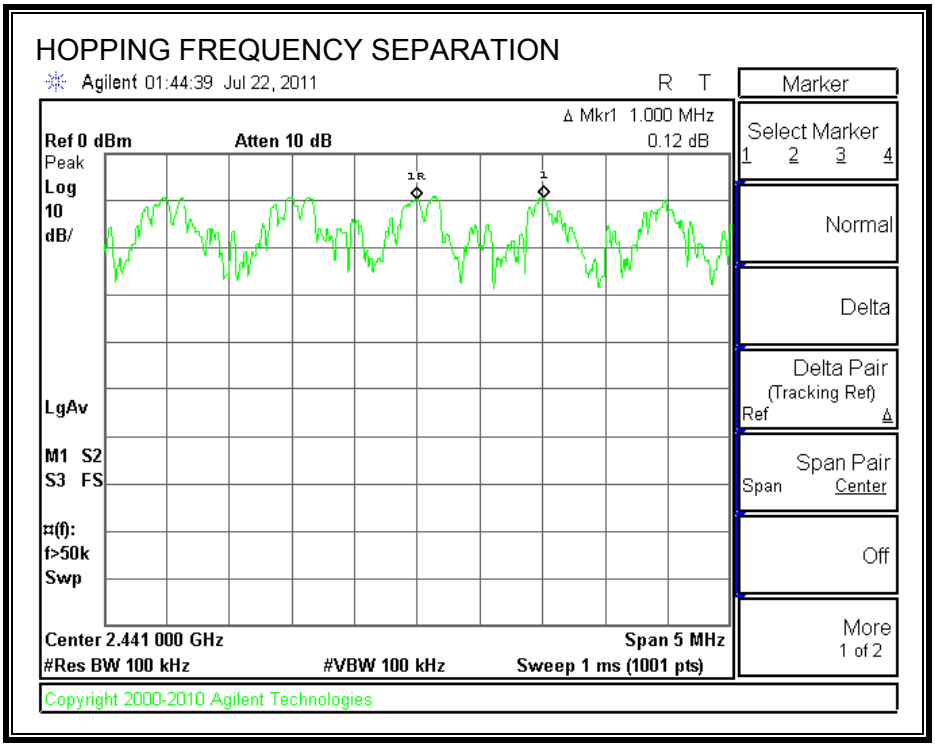
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

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

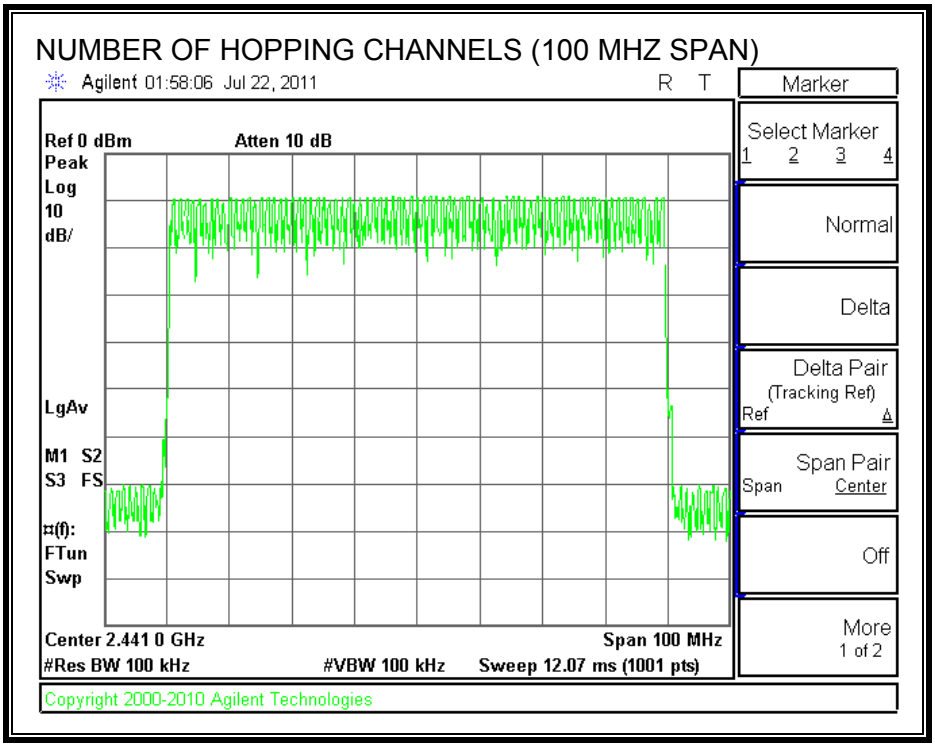
TEST PROCEDURE

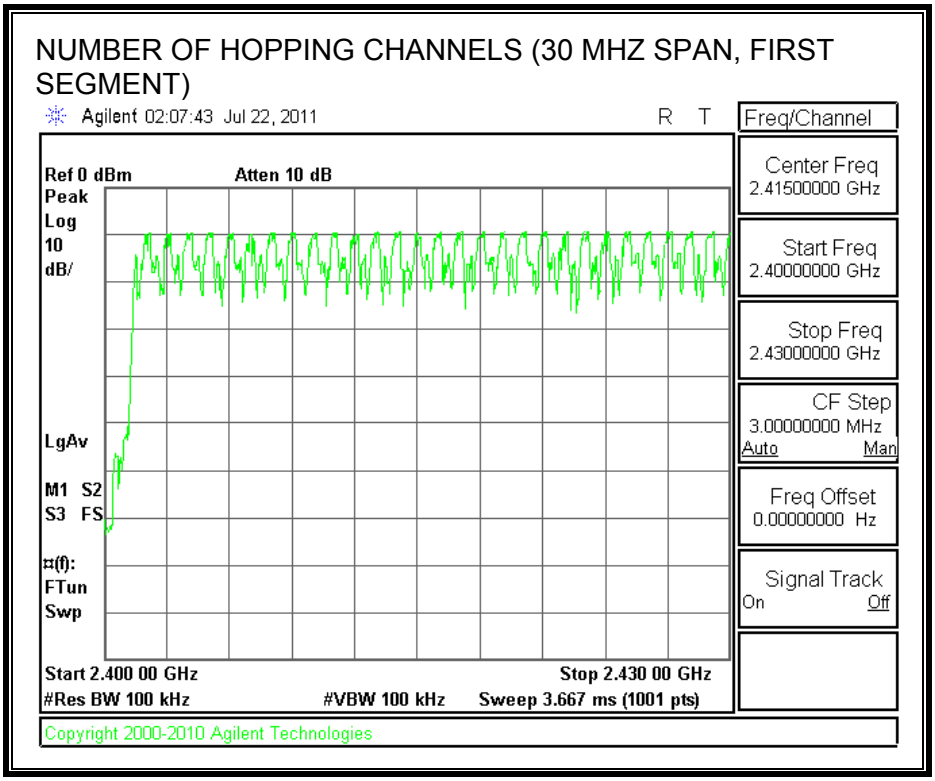
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

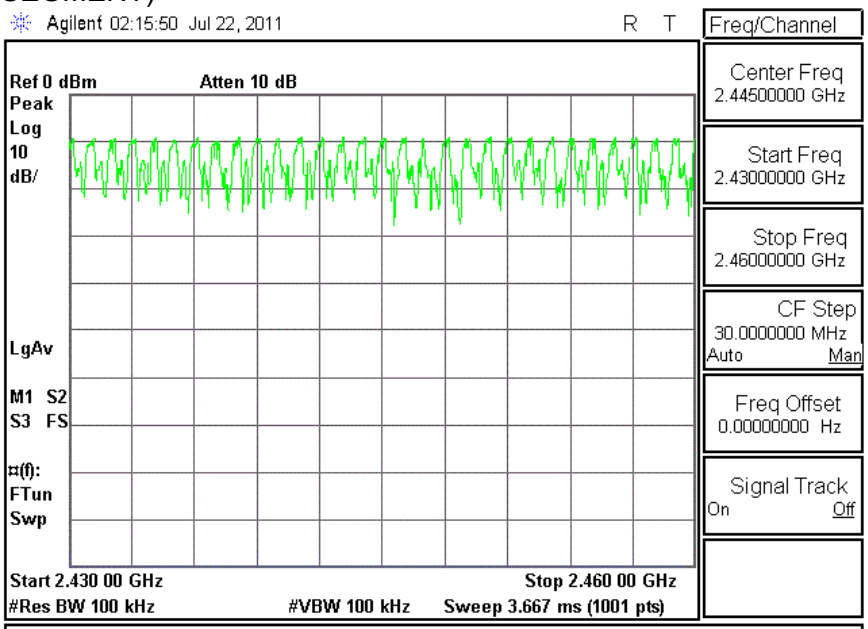
79 Channels observed.

NUMBER OF HOPPING CHANNELS

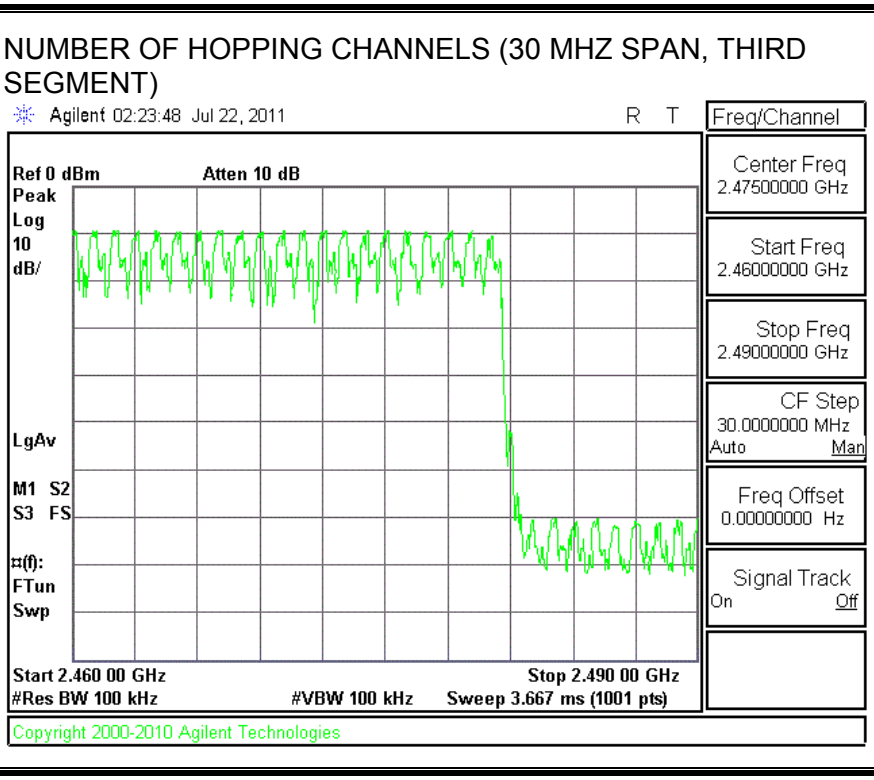




NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, SECOND SEGMENT)



NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, THIRD SEGMENT)



7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

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.

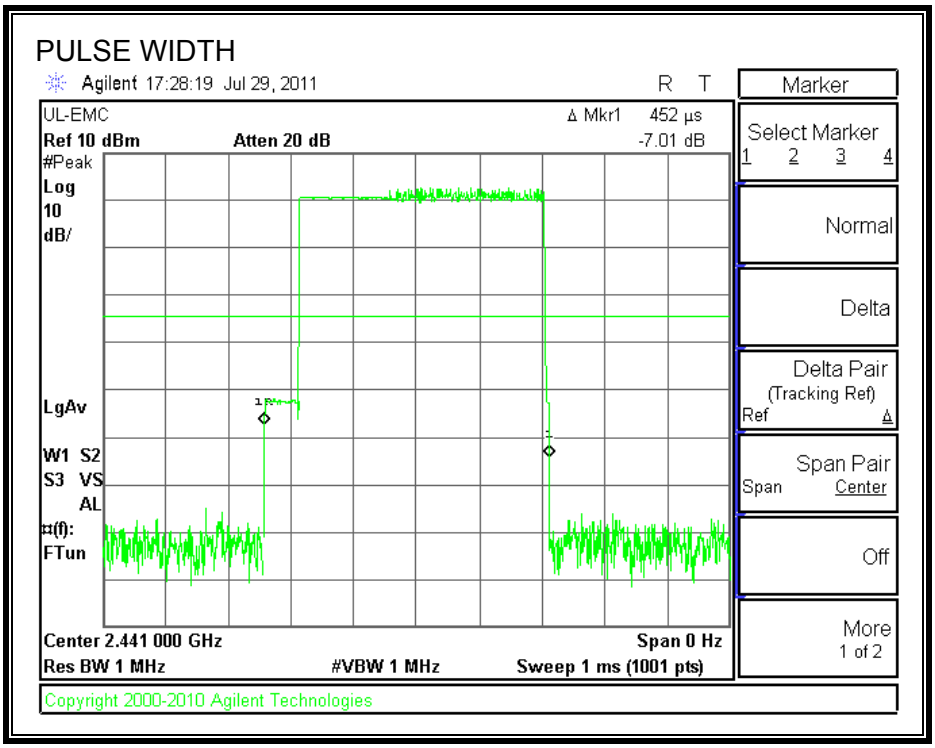
RESULTS

8PSK Mode

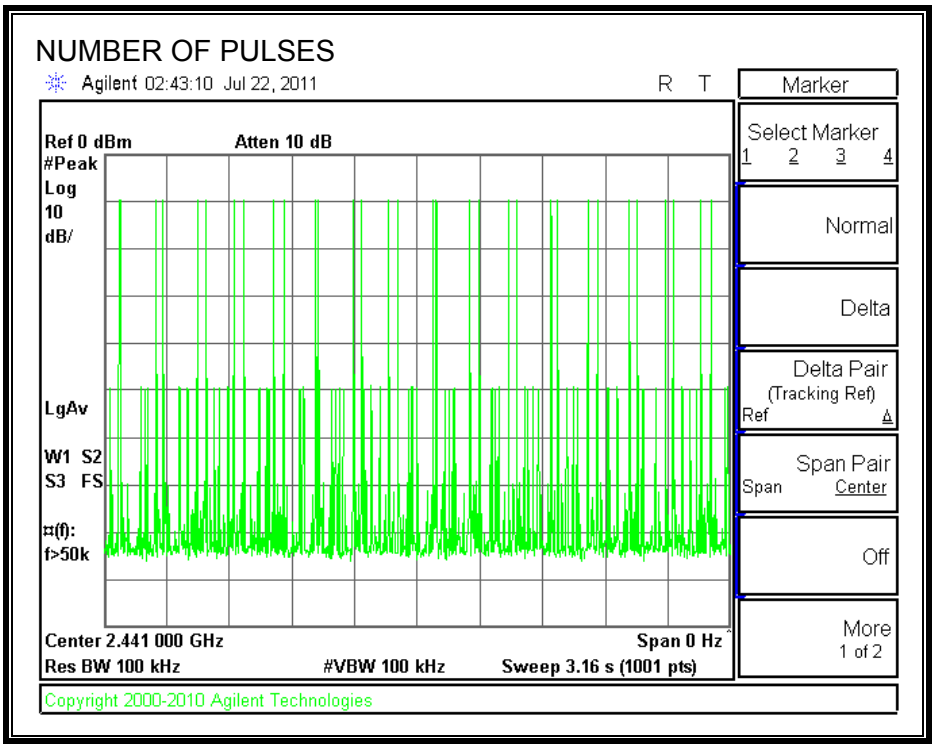
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
DH1	0.452	31	0.140	0.4	0.260
DH3	1.7	19	0.323	0.4	0.077
DH5	2.95	13	0.384	0.4	0.017

DH1

PULSE WIDTH

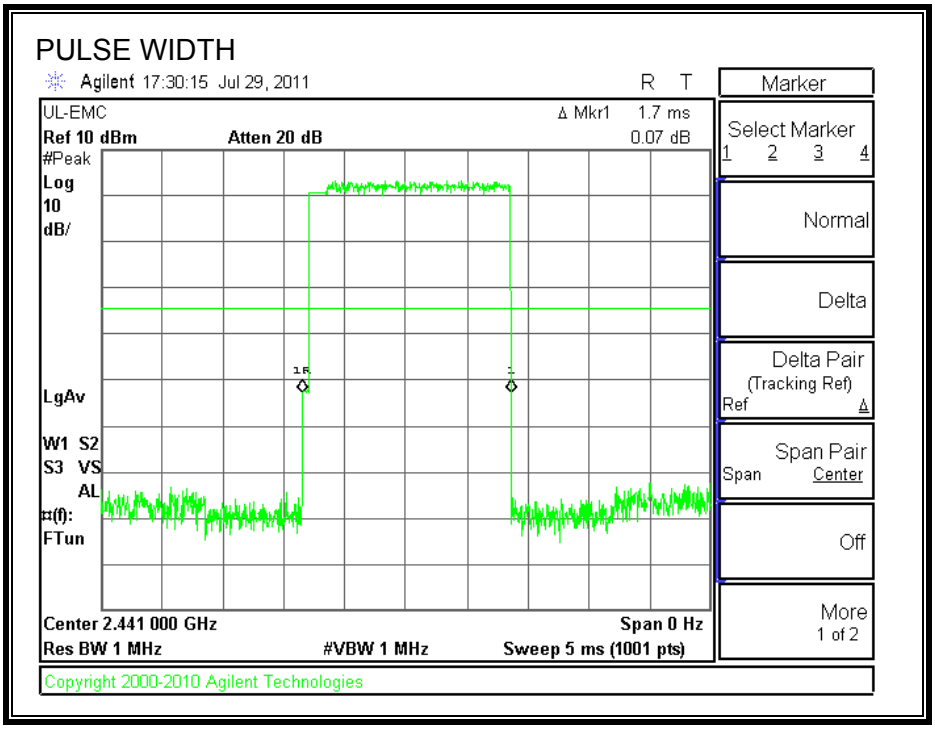


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

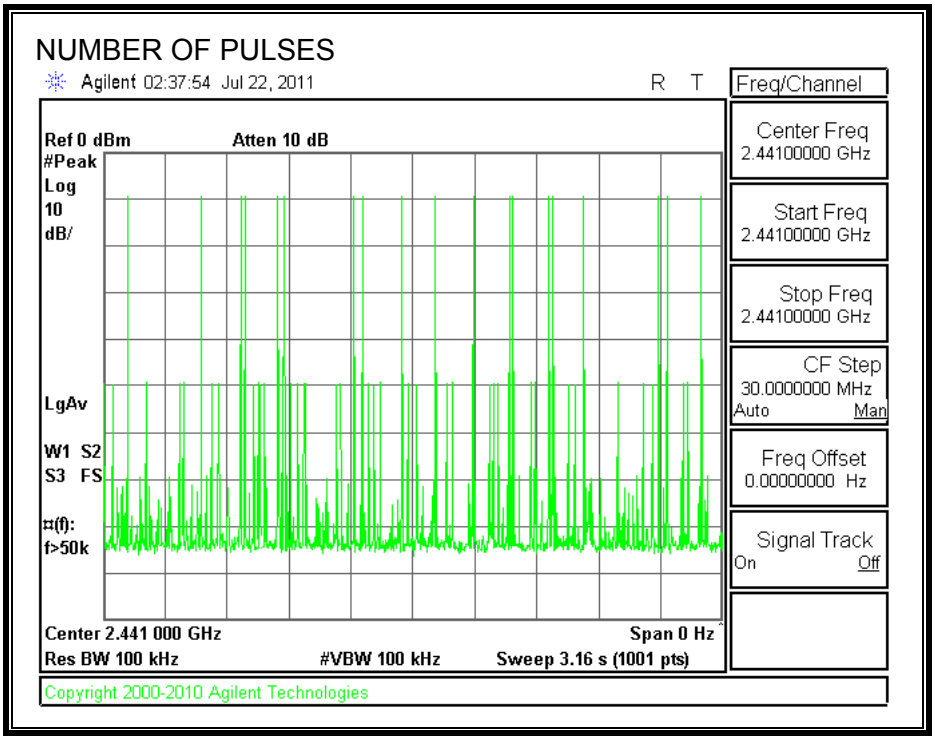


DH3

PULSE WIDTH

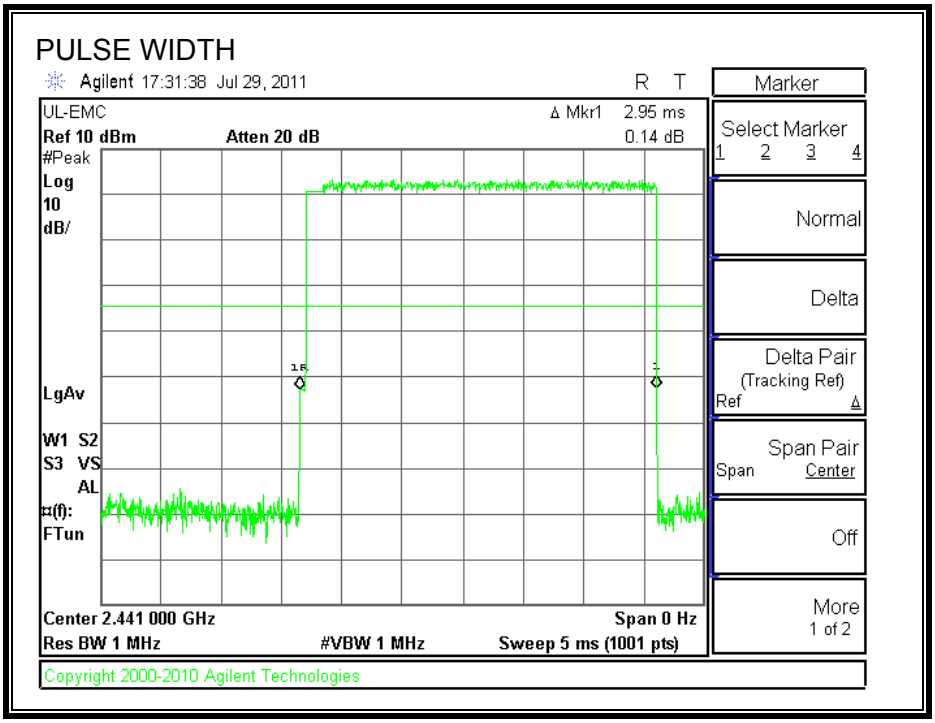


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD

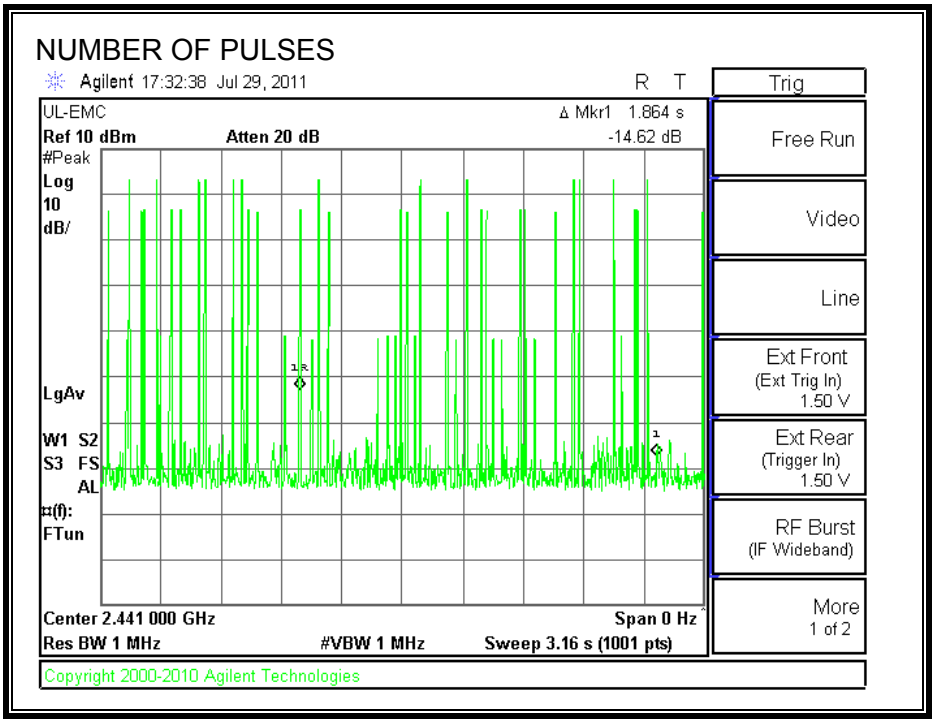


DH5

PULSE WIDTH



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.2.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

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

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.

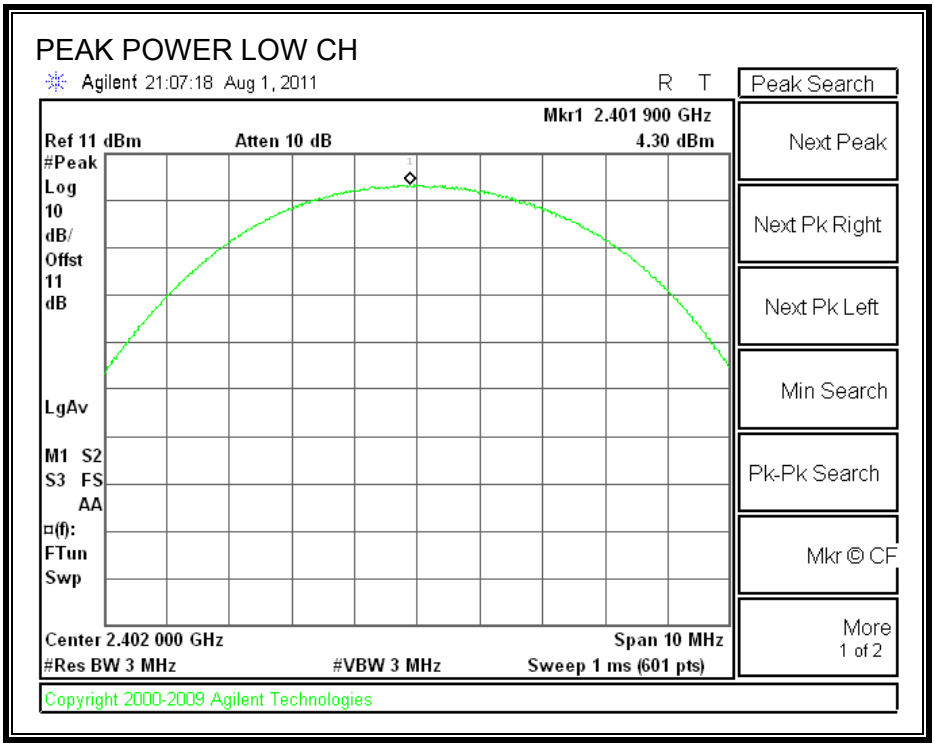
TEST PROCEDURE

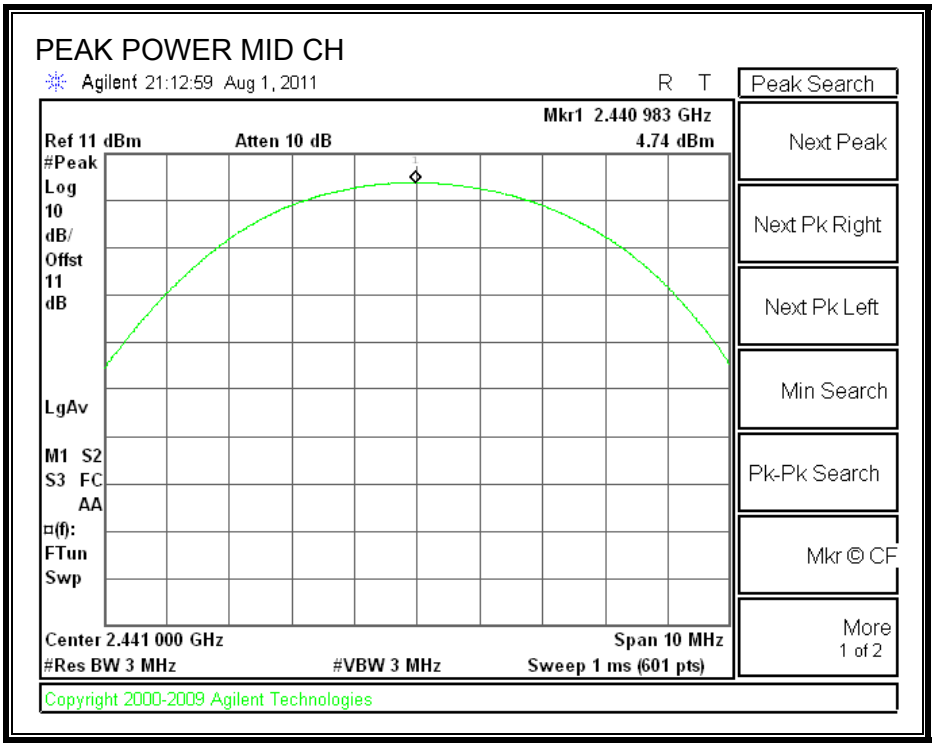
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

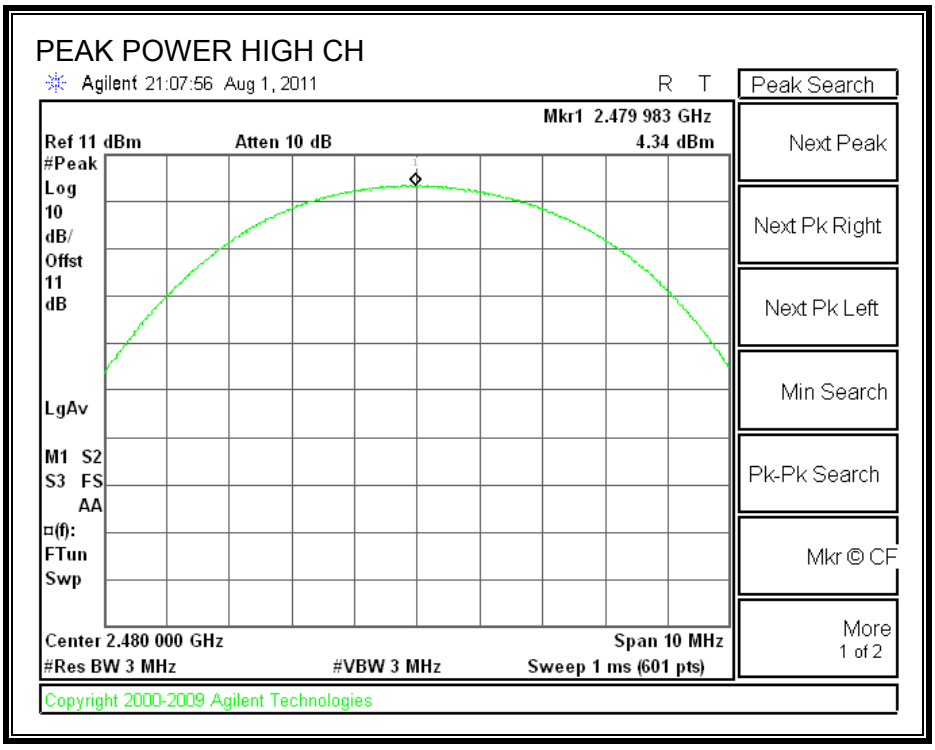
RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.30	21	-16.70
Middle	2441	4.74	21	-16.26
High	2480	4.34	21	-16.66

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 11 dB (including 10 dB pad and 1.0 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	1.680
Middle	2441	2.190
High	2480	1.310

7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

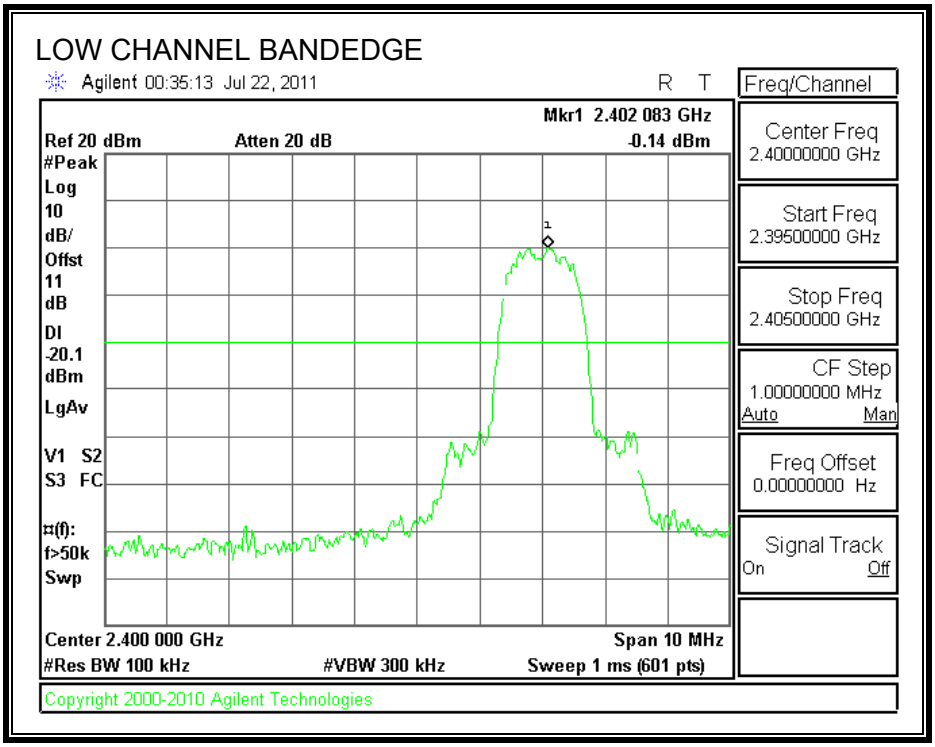
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

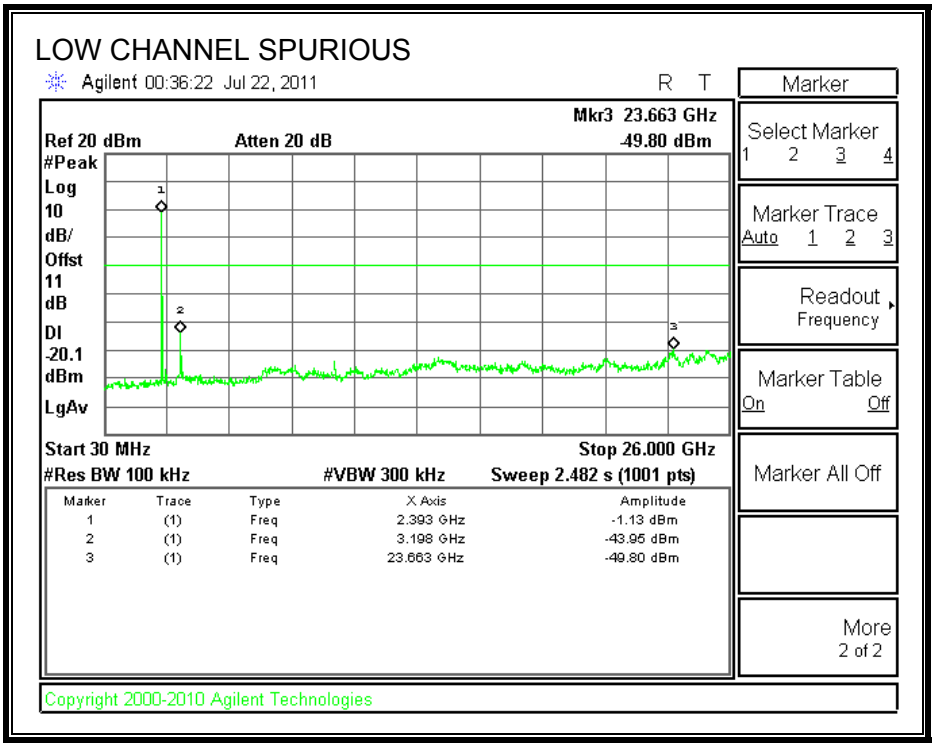
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

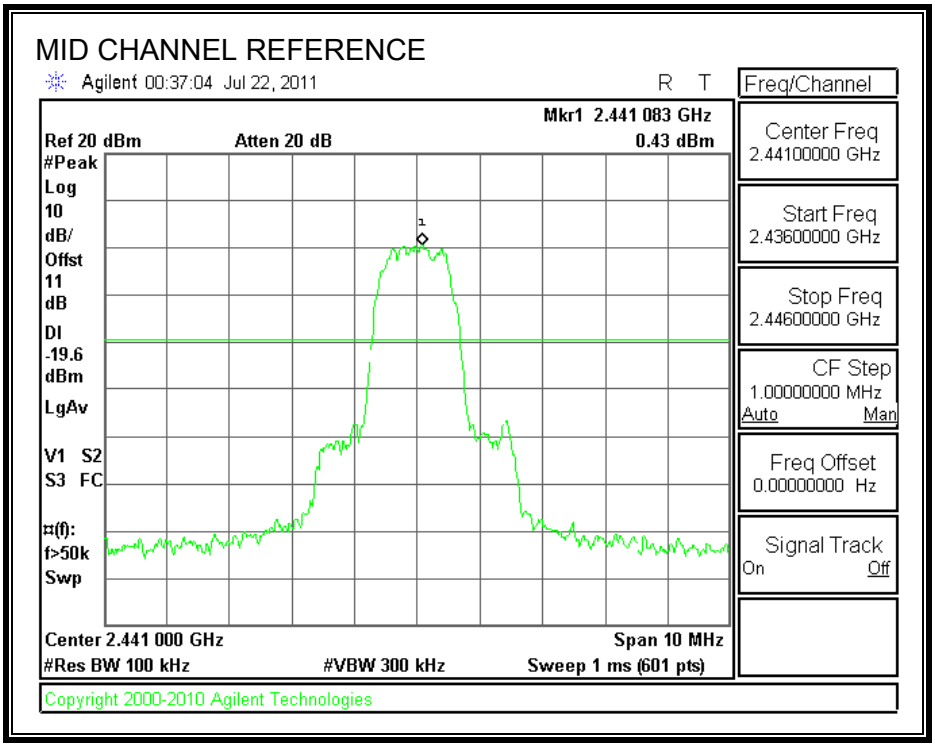
RESULTS

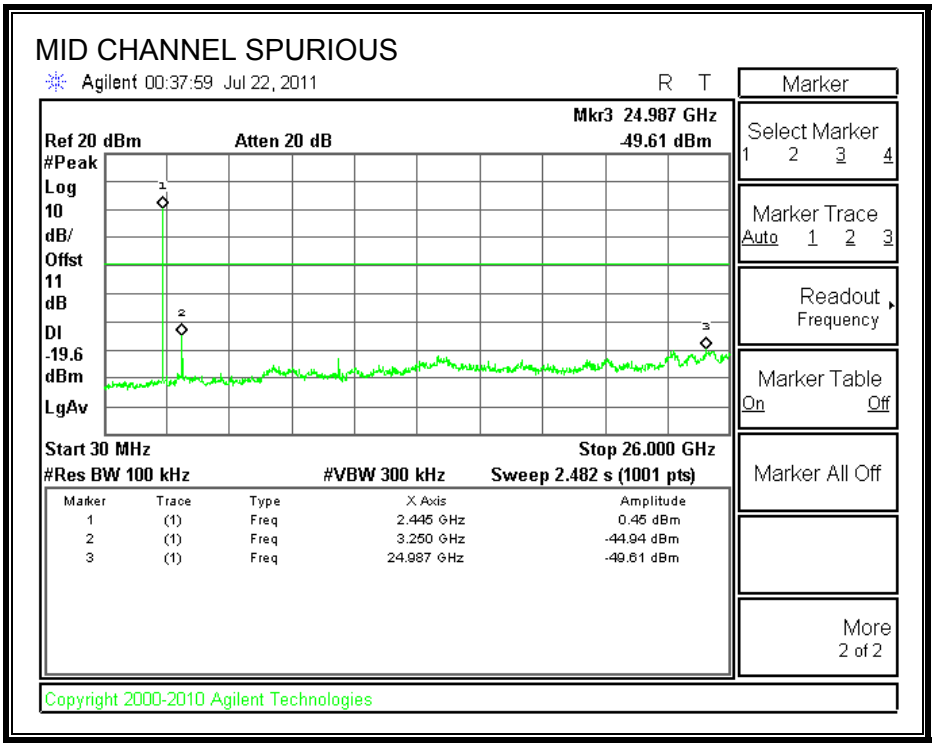
SPURIOUS EMISSIONS, LOW CHANNEL



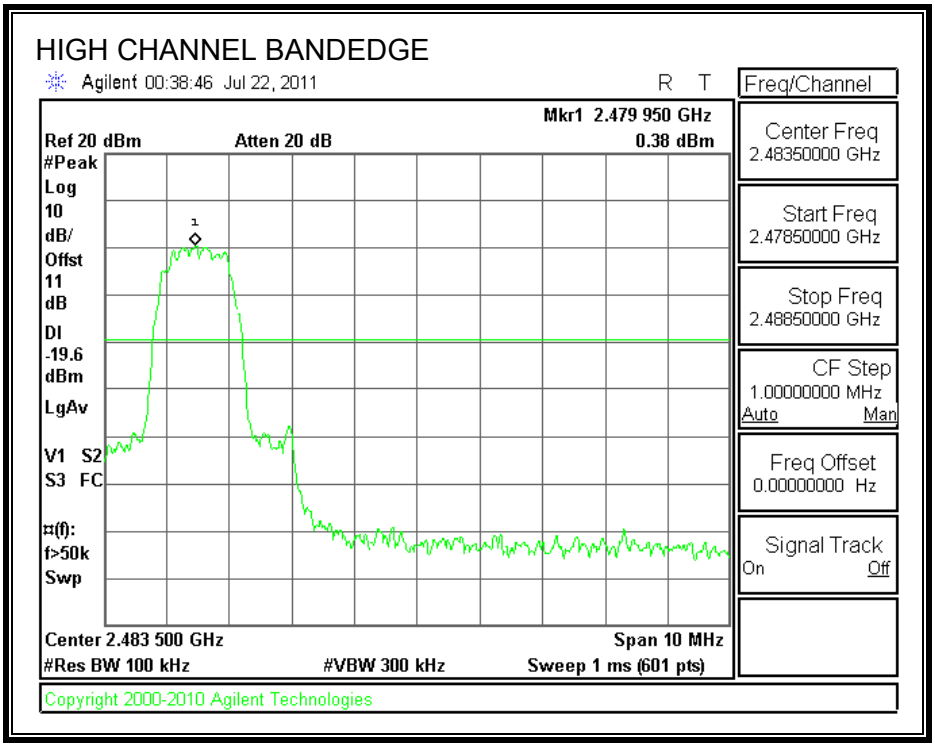


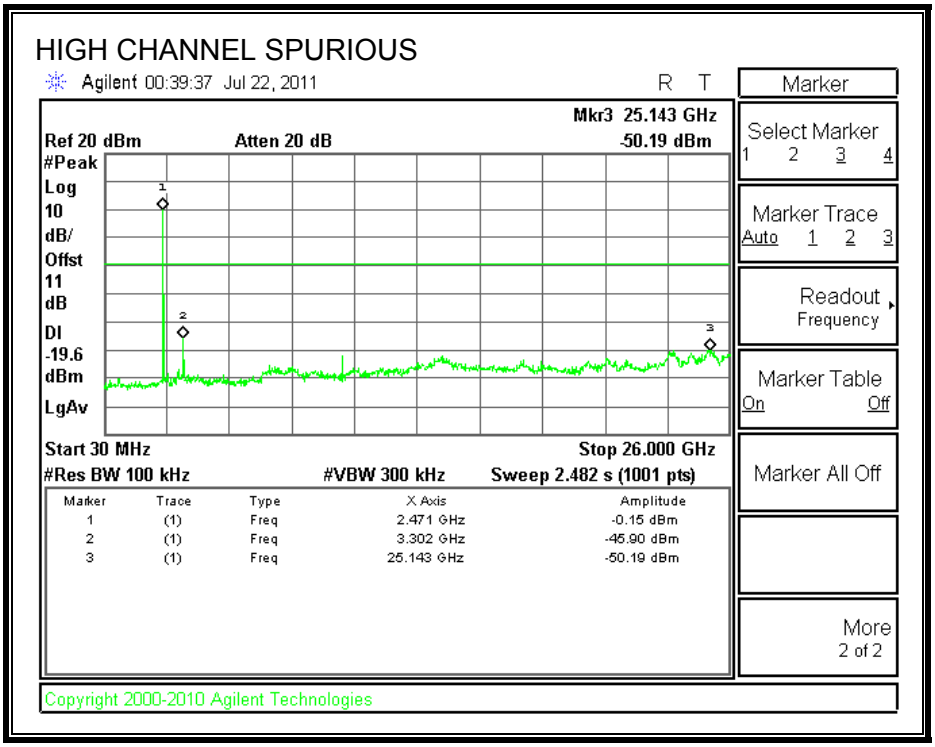
SPURIOUS EMISSIONS, MID CHANNEL





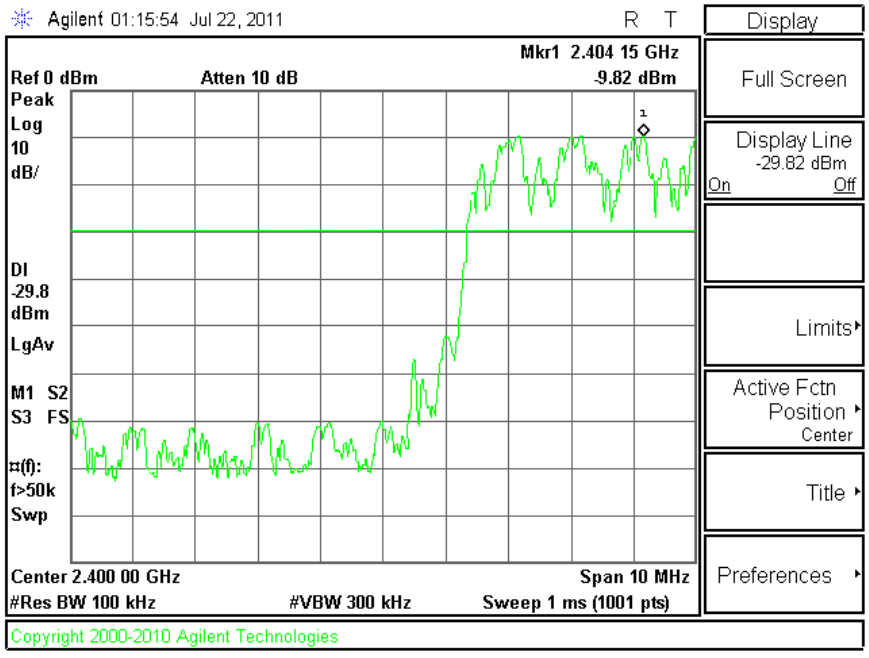
SPURIOUS EMISSIONS, HIGH CHANNEL



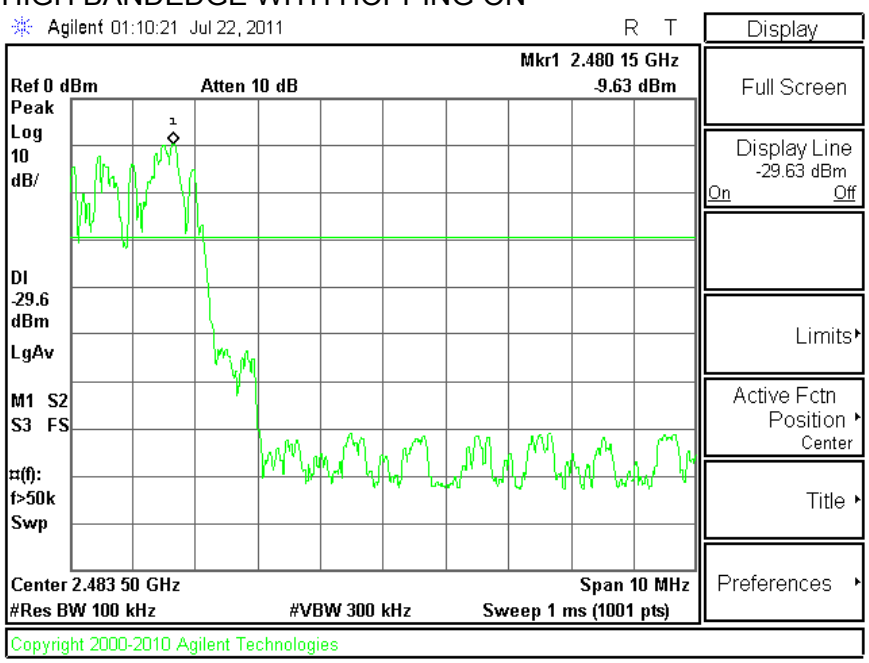


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

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

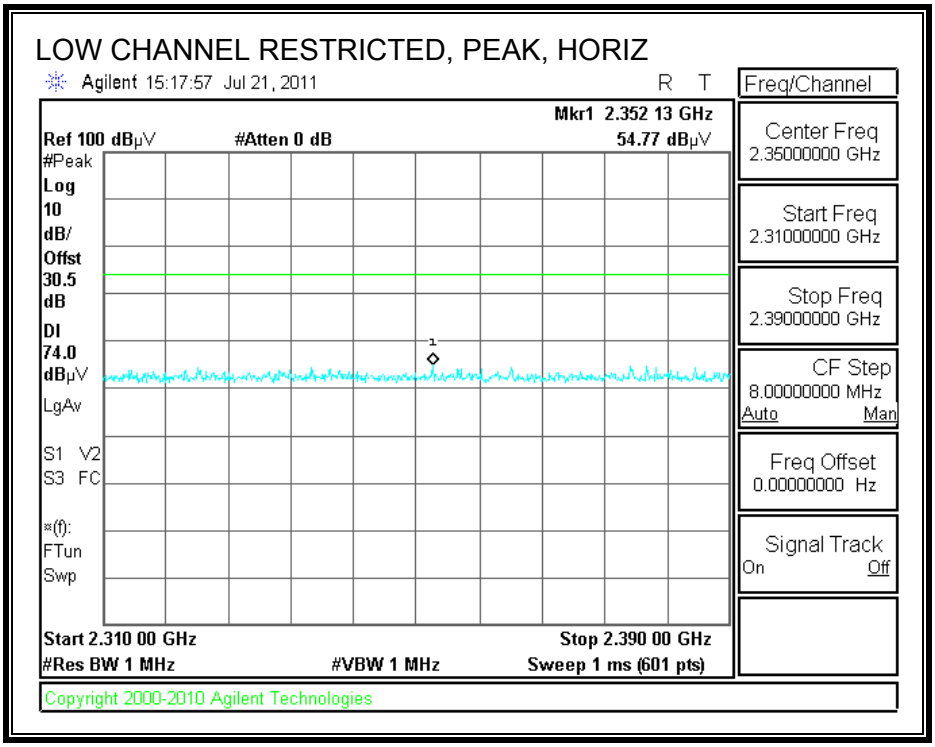
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

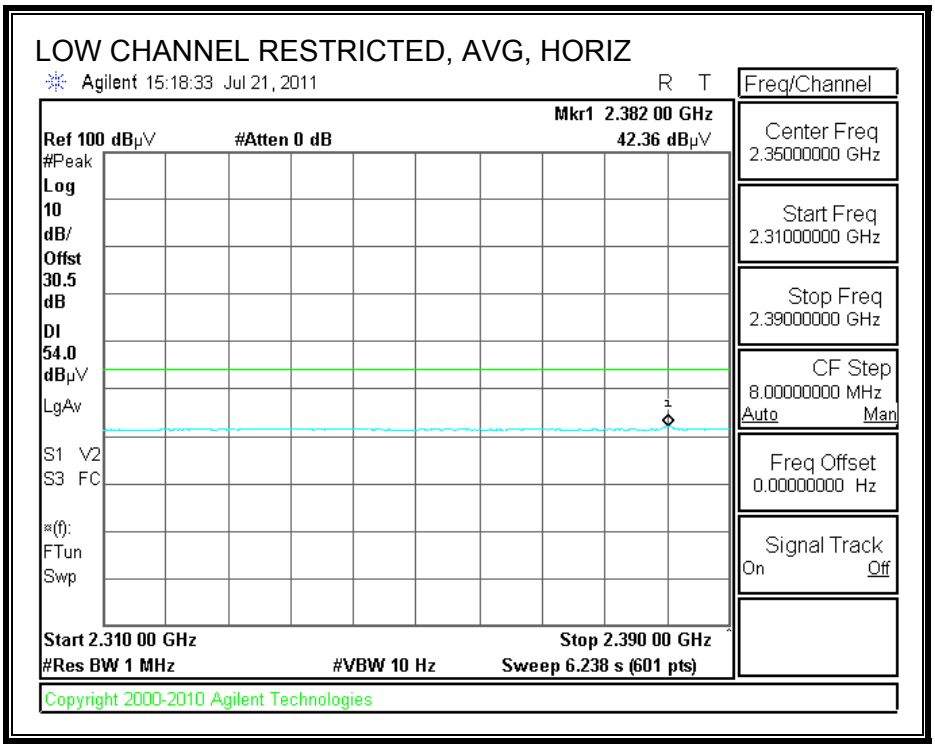
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

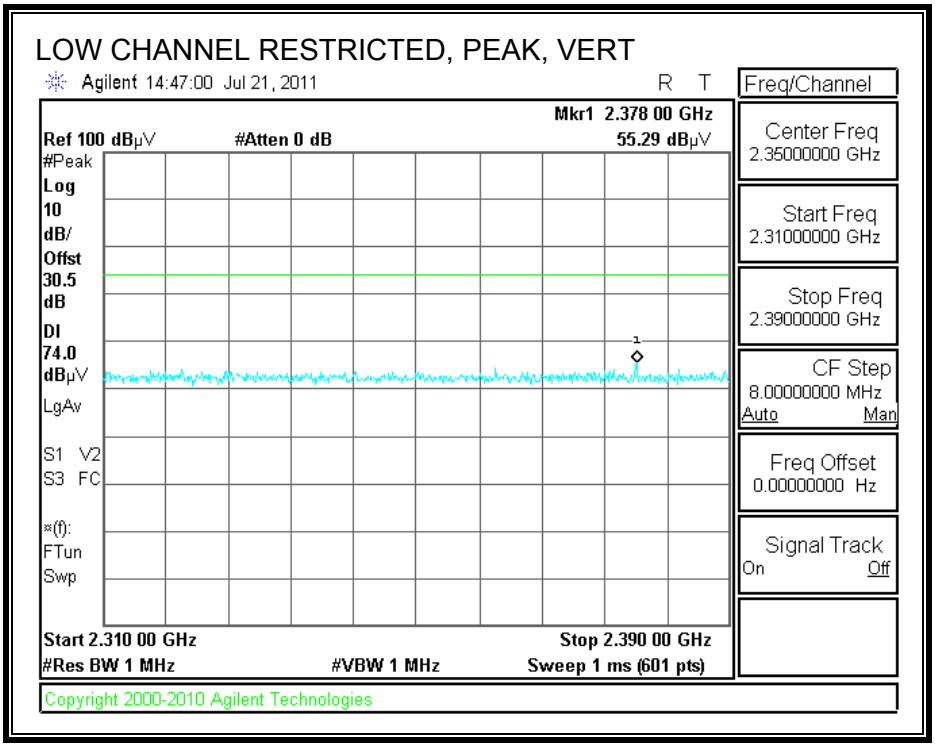
8.2.1. BASIC DATA RATE GFSK MODULATION

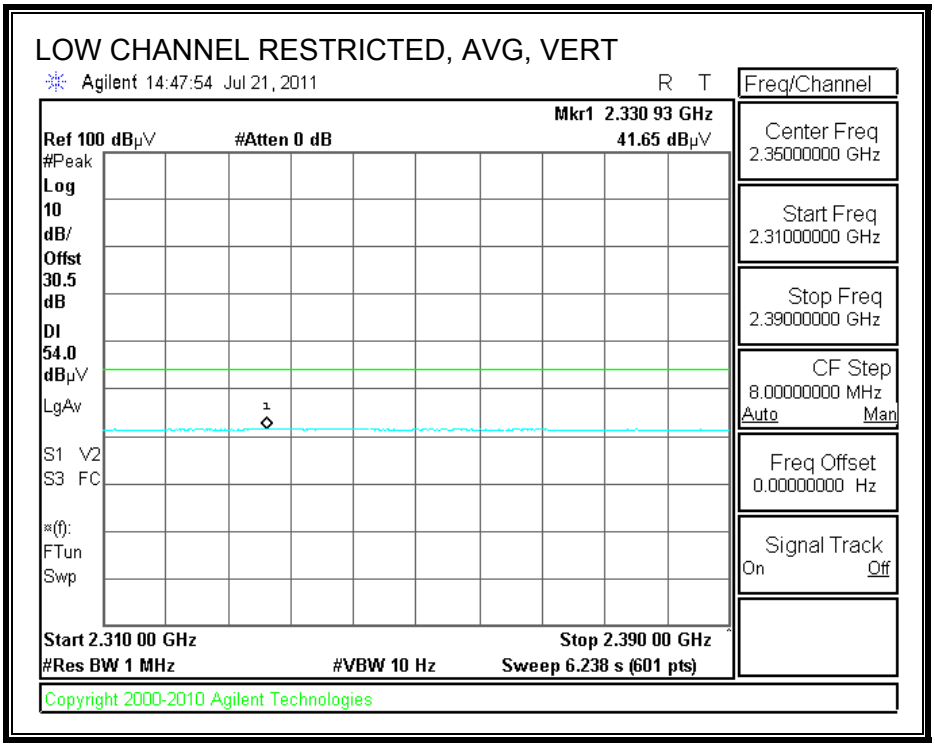
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



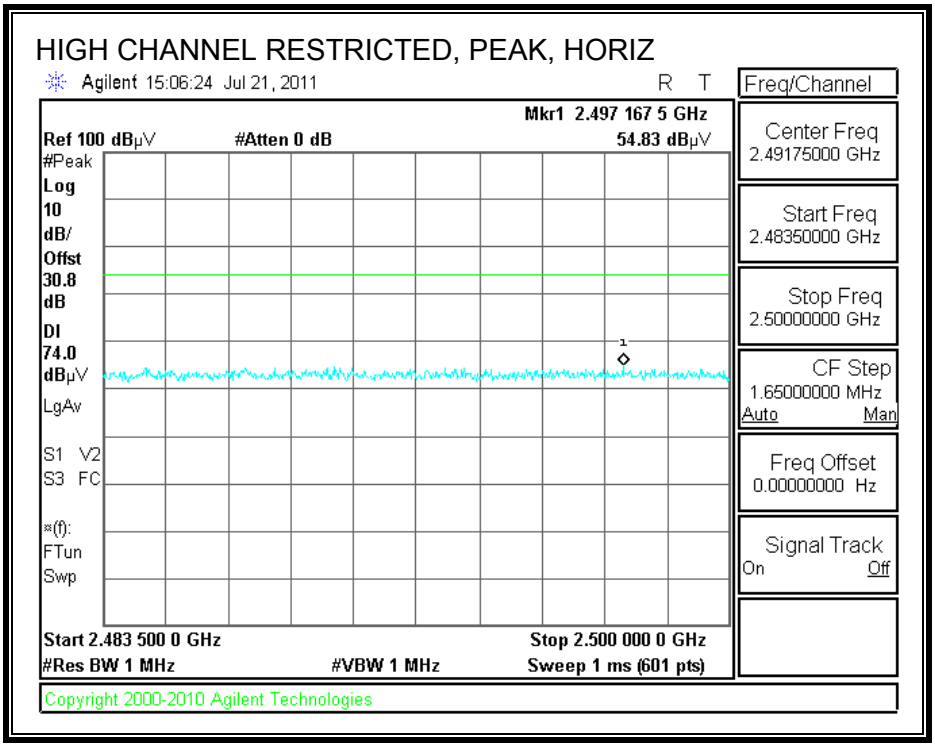


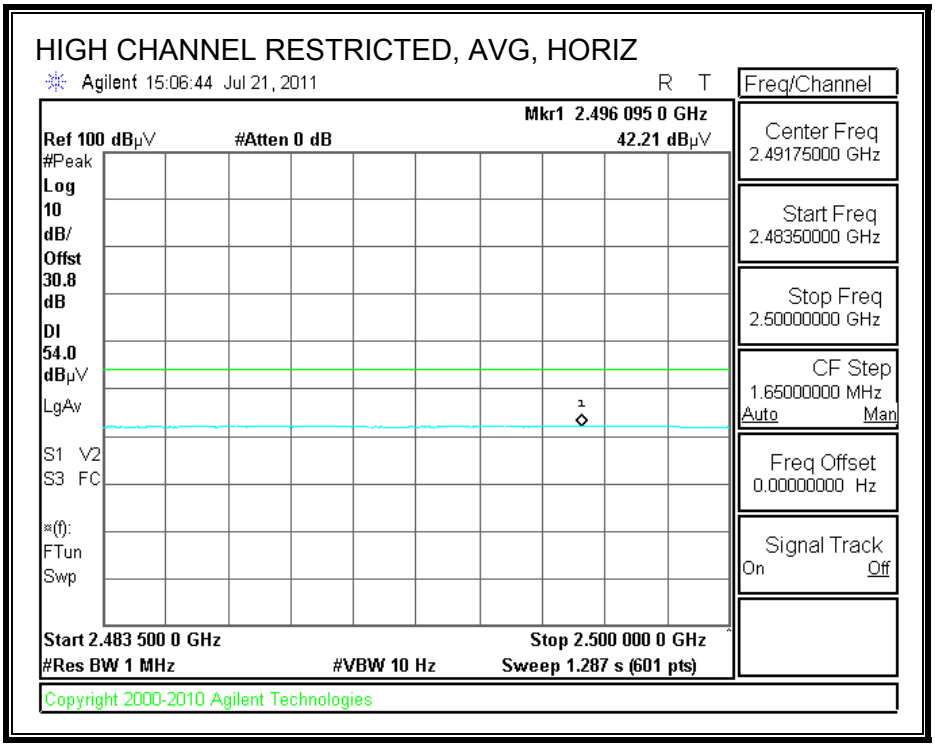
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



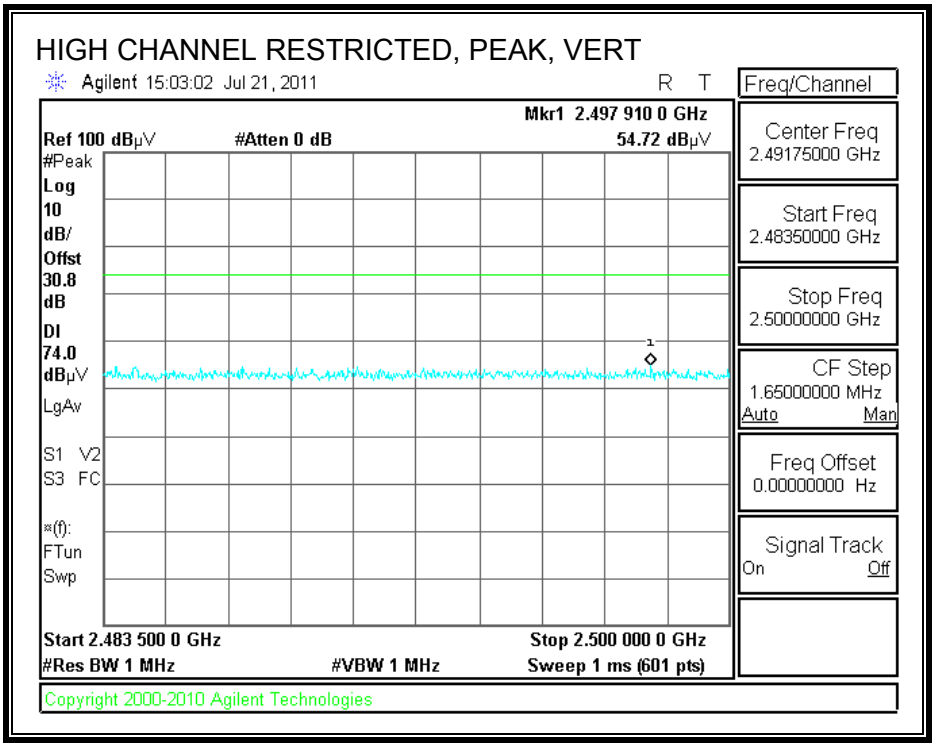


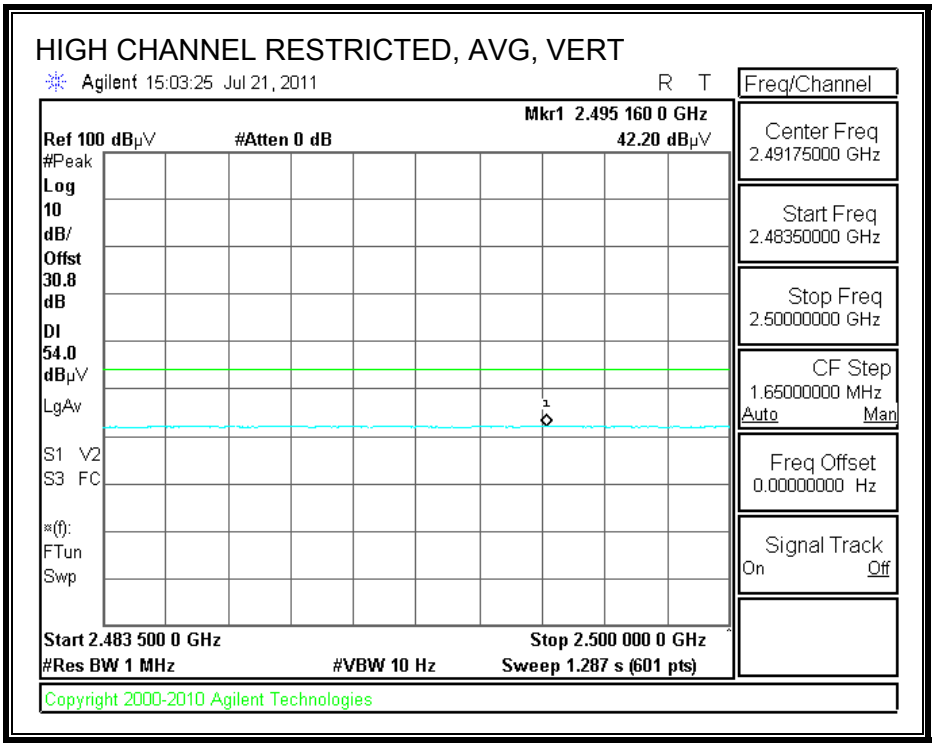
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 1!U13947
Date: 7/21/2011
Test Engineer: David Garcia
Configuration: EUT, Adapter board, Laptop PC
Mode: Tx, GFSK

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B		T39; ARA 18-26GHz; S/N:1013	FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_2.7GHz	

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

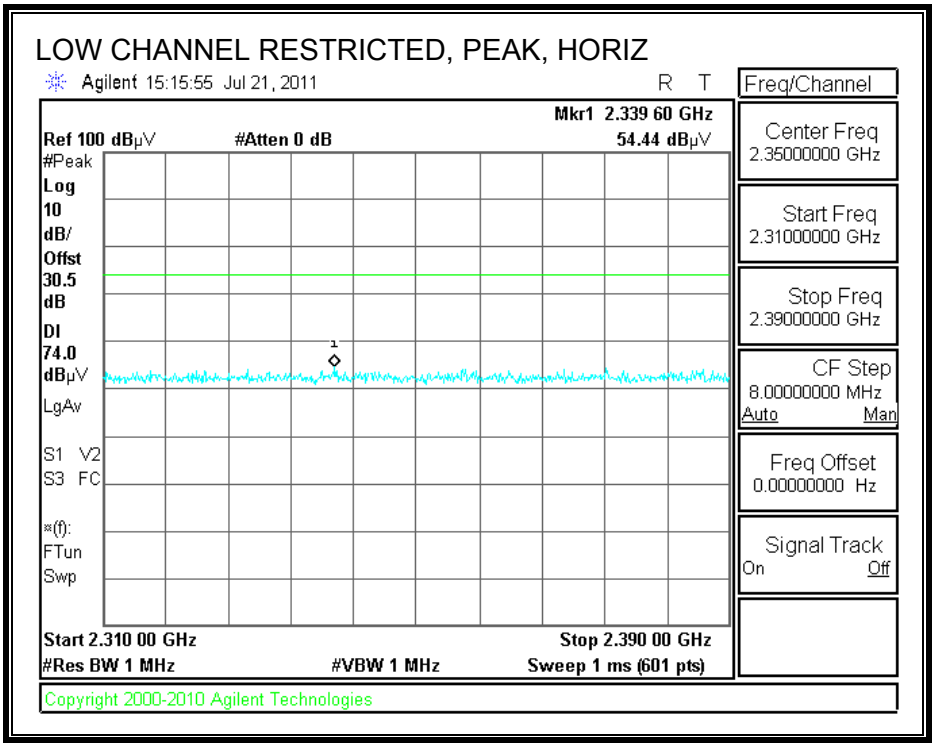
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Channel: 2402 MHz															
4.804	3.0	39.5	31.5	33.9	6.8	-34.1	0.0	0.5	46.5	38.6	74	54	-27.5	-15.4	H
4.804	3.0	40.6	34.4	33.9	6.8	-34.1	0.0	0.5	47.7	41.4	74	54	-26.3	-12.6	V
9.608	3.0	33.8	22.5	38.5	9.1	-33.3	0.0	0.7	48.6	37.3	74	54	-25.4	-16.7	V
Mid Channel: 2441 MHz															
4.882	3.0	38.7	31.9	33.9	6.8	-34.0	0.0	0.5	45.9	39.1	74	54	-28.1	-14.9	H
4.882	3.0	40.3	35.2	33.9	6.8	-34.0	0.0	0.5	47.5	42.5	74	54	-26.5	-11.5	V
9.764	3.0	33.6	23.1	38.5	9.1	-33.0	0.0	0.7	48.8	38.4	74	54	-25.2	-15.6	V
High Channel: 2480 MHz															
4.960	3.0	36.6	29.2	34.0	6.9	-34.0	0.0	0.5	44.0	36.7	74	54	-30.0	-17.3	H
4.960	3.0	39.9	33.7	34.0	6.9	-34.0	0.0	0.5	47.3	41.1	74	54	-26.7	-12.9	V

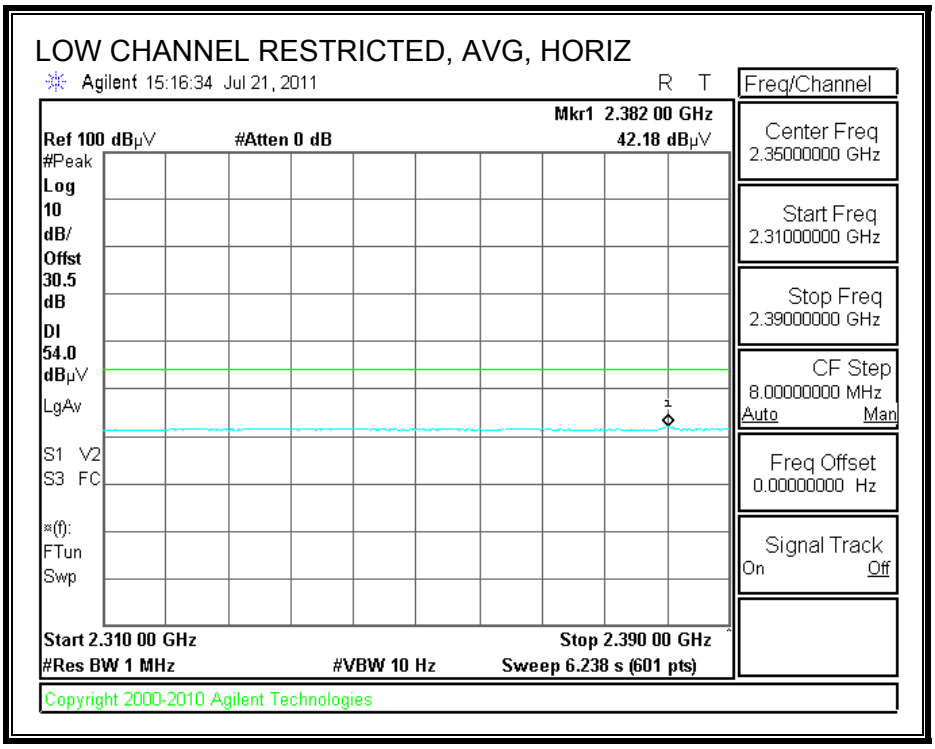
Rev. 07.08.11

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

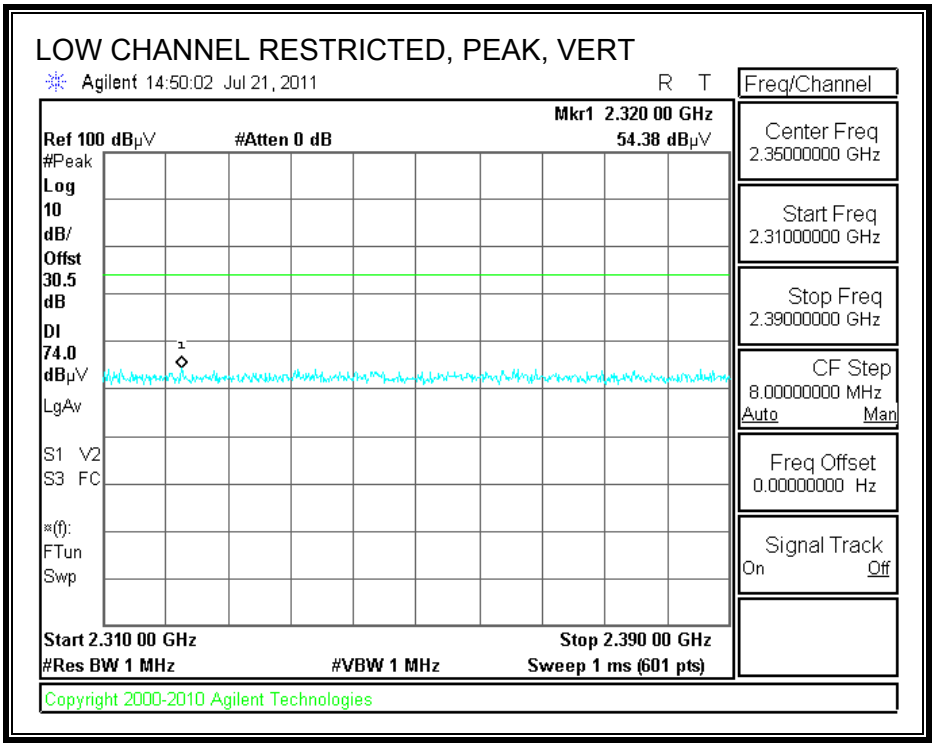
8.2.2. ENHANCED DATA RATE 8PSK MODULATION

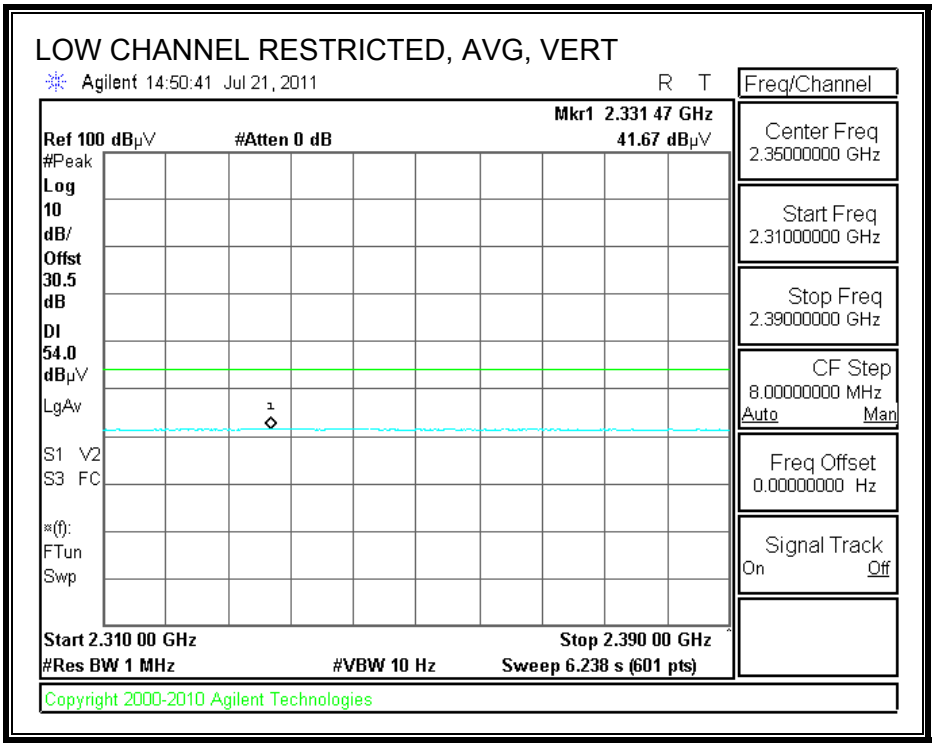
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



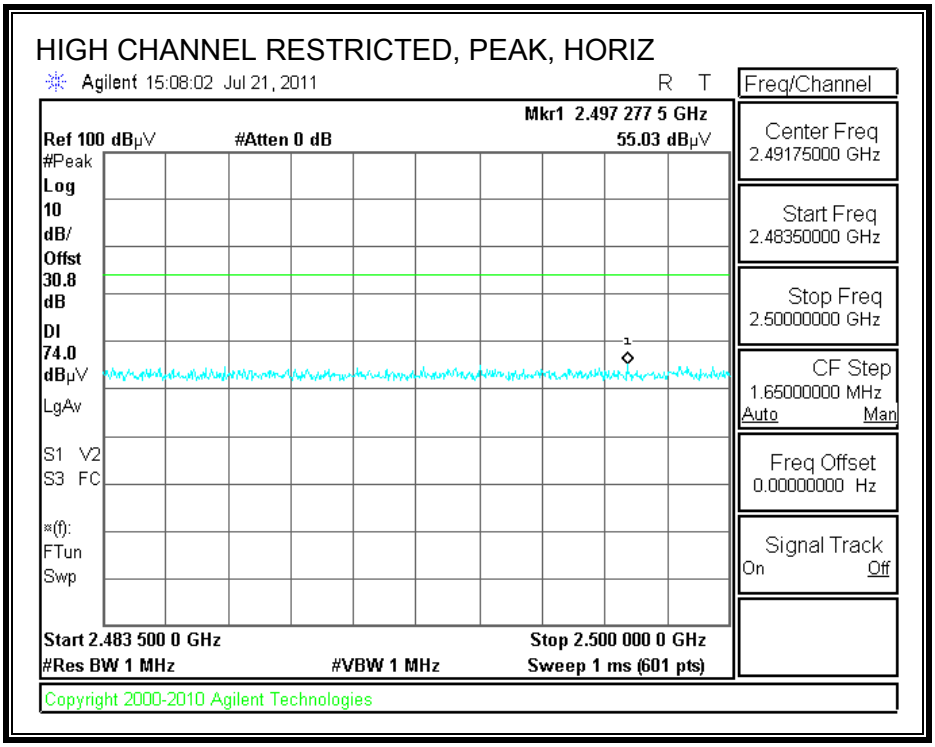


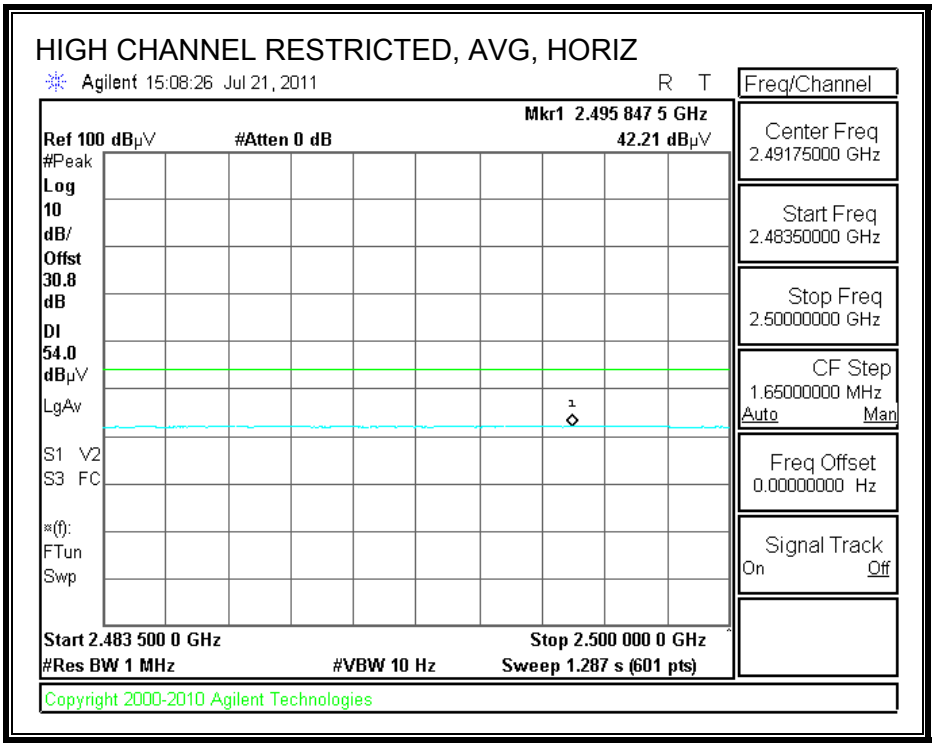
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



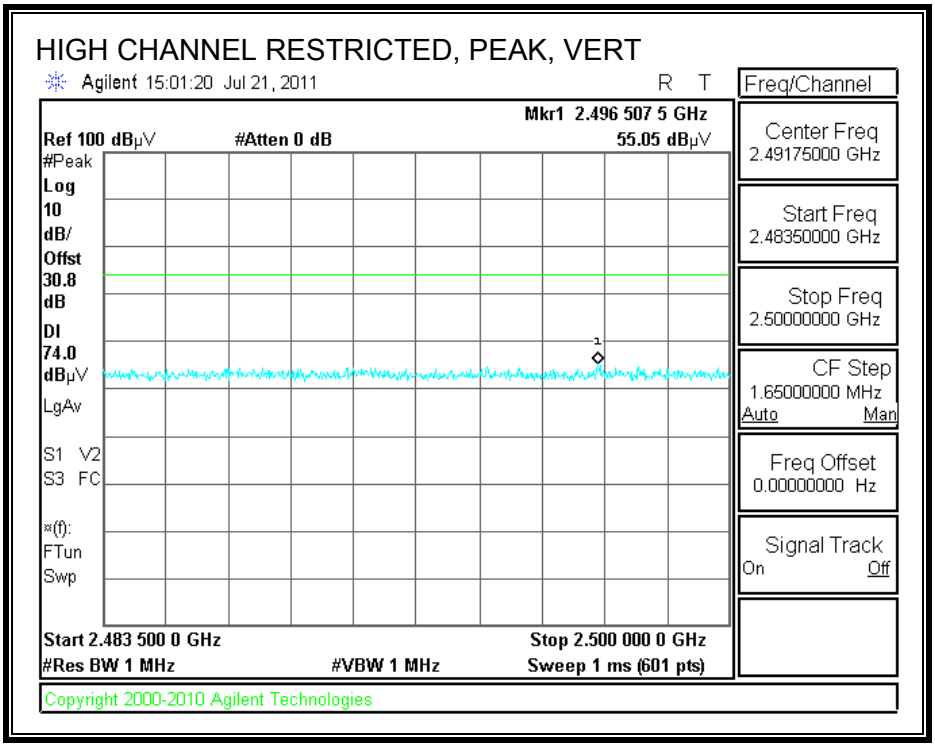


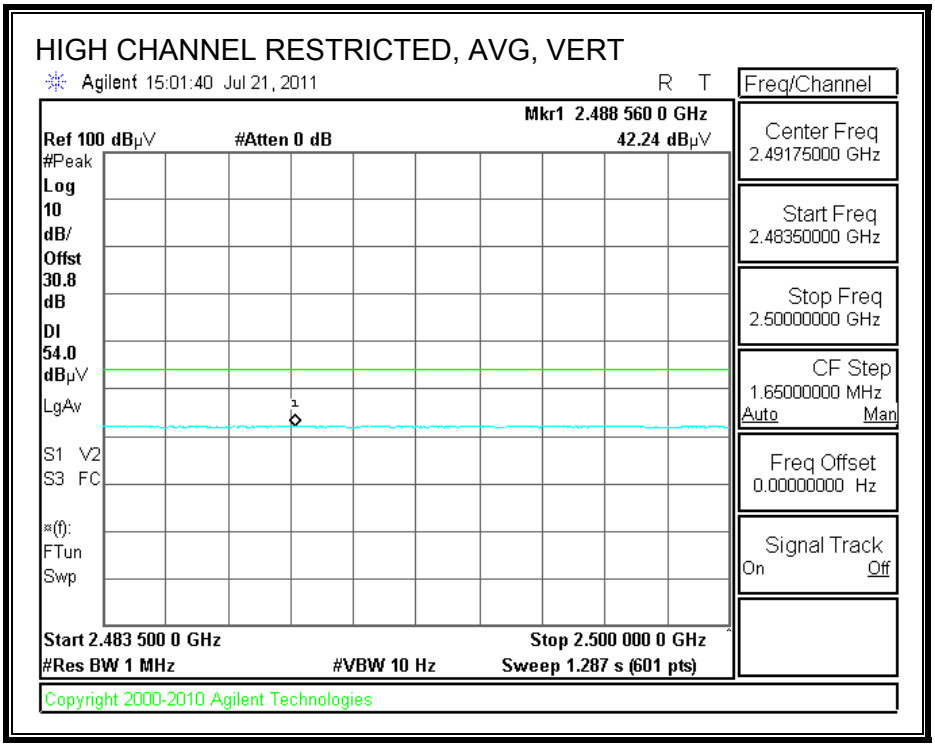
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 3m Chamber

Company: Broadcom
Project #: 1!U13947
Date: 7/21/2011
Test Engineer: David Garcia
Configuration: EUT, Adapter board, Laptop PC
Mode: Tx, 8PSK

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B		T39; ARA 18-26GHz; S/N:1013	FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_2.7GHz	

Peak Measurements
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 Channel: 2402 MHz															
4.804	3.0	40.7	30.4	33.9	6.8	-34.1	0.0	0.5	47.8	37.5	74	54	-26.2	-16.5	H
4.804	3.0	41.0	33.6	33.9	6.8	-34.1	0.0	0.5	48.0	40.7	74	54	-26.0	-13.3	V
9.608	3.0	34.1	22.1	38.5	9.1	-33.3	0.0	0.7	49.0	37.0	74	54	-25.0	-17.0	
Mid Channel: 2441 MHz															
4.882	3.0	39.2	30.0	33.9	6.8	-34.0	0.0	0.5	46.4	37.2	74	54	-27.6	-16.8	H
4.882	3.0	41.9	33.7	33.9	6.8	-34.0	0.0	0.5	49.1	40.9	74	54	-24.9	-13.1	V
9.764	3.0	34.0	22.1	38.5	9.1	-33.0	0.0	0.7	49.3	37.4	74	54	-24.7	-16.6	V
High Channel: 2480 MHz															V
4.960	3.0	37.5	28.3	34.0	6.9	-34.0	0.0	0.5	44.9	35.8	74	54	-29.1	-18.2	H
4.960	3.0	40.5	33.4	34.0	6.9	-34.0	0.0	0.5	47.9	40.8	74	54	-26.1	-13.2	V

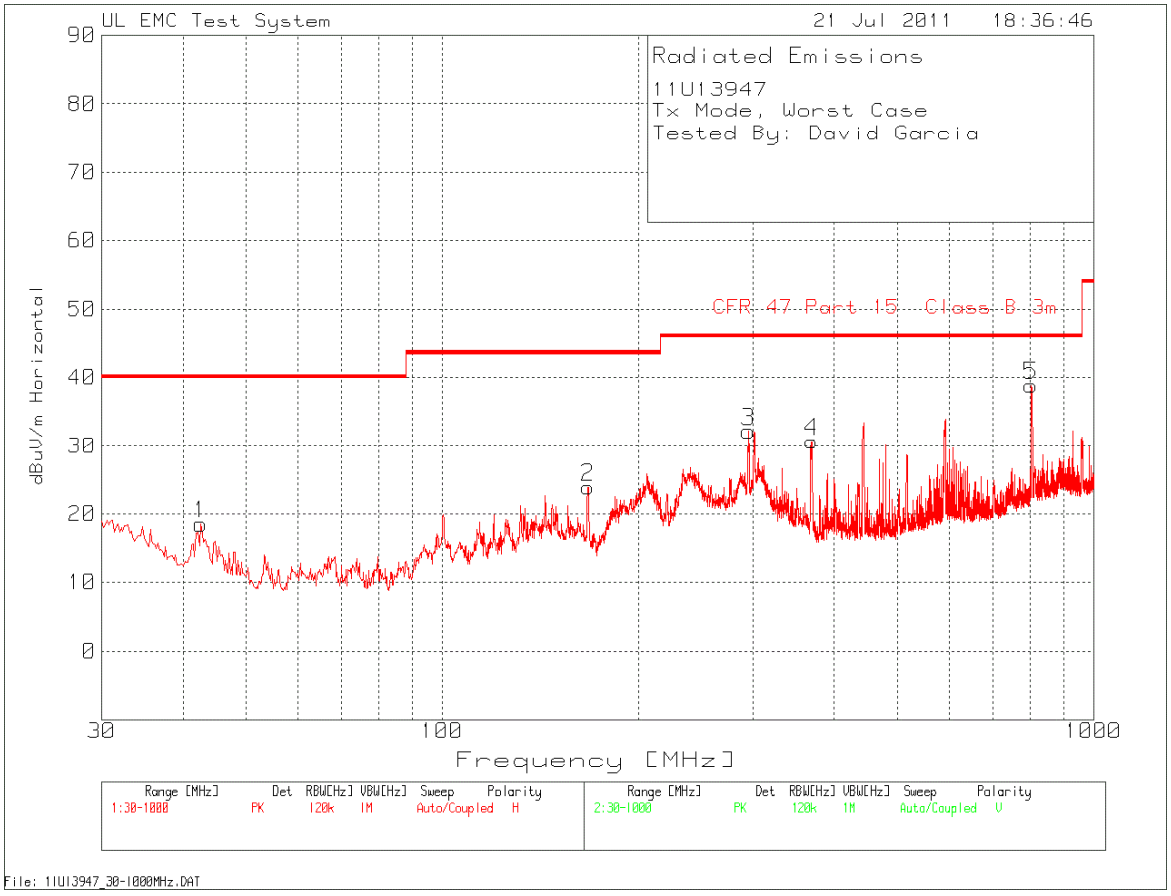
Rev. 07.08.11

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. WORST-CASE BELOW 1 GHz

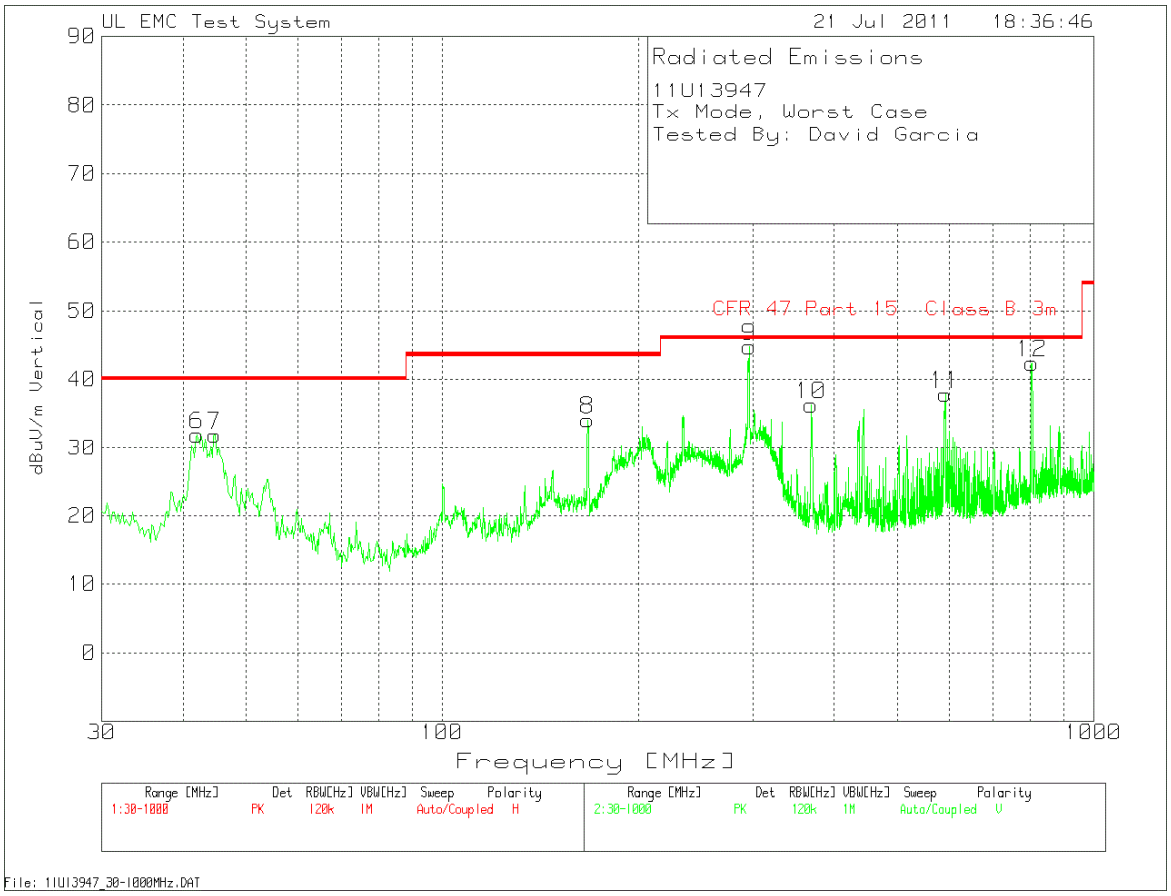
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

Company Name:	Broadcom
Project Number:	11U13947
Model Number:	BCM920702MD_REF14L
Test Date:	7/21/2011
Test Engineer:	David Garcia
Mode:	Tx Mode, Worst Case

Test Frequency MHz	Meter Reading	Detector	3m below 1GHz Cable.TXT [dB]	3m T15 PreAmp below 1GHz.TXT [dB]	3m Bilog T185 below 1GHz.TXT [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin	Height [cm]	Polarity
42.5999	33.5	PK	0.7	-28.2	12.5	18.5	40	-21.5	251	Horz
167.4361	38.68	PK	1.3	-27.8	11.7	23.88	43.5	-19.62	251	Horz
295.1799	44.33	PK	1.8	-27.3	13.3	32.13	46	-13.87	176	Horz
369.2286	41.85	PK	2	-27.7	14.5	30.65	46	-15.35	251	Horz
802.472	43.07	PK	2.9	-28	20.9	38.87	46	-7.13	101	Horz
42.0184	46.72	PK	0.7	-28.2	12.7	31.92	40	-8.08	99	Vert
44.7322	47.55	PK	0.7	-28.2	11.8	31.85	40	-8.15	99	Vert
167.2422	48.8	PK	1.3	-27.8	11.8	34.1	43.5	-9.4	99	Vert
295.9552	56.87	PK	1.8	-27.3	13.4	44.77	46	-1.23	99	Vert
368.6471	47.5	PK	2	-27.7	14.5	36.3	46	-9.7	251	Vert
591.9564	45.42	PK	2.5	-28.4	18.3	37.82	46	-8.18	99	Vert
804.7982	46.61	PK	2.9	-28	20.9	42.41	46	-3.59	99	Vert

10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

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

Company Name:	Broadcom
Project Number:	11U13947
Model Number:	BCM920702MD_REF14L
Test Date:	7/21/2011
Test Engineer:	David Garcia
Mode:	Tx Mode, Worst Case

Line-L1 .15 - 30MHz

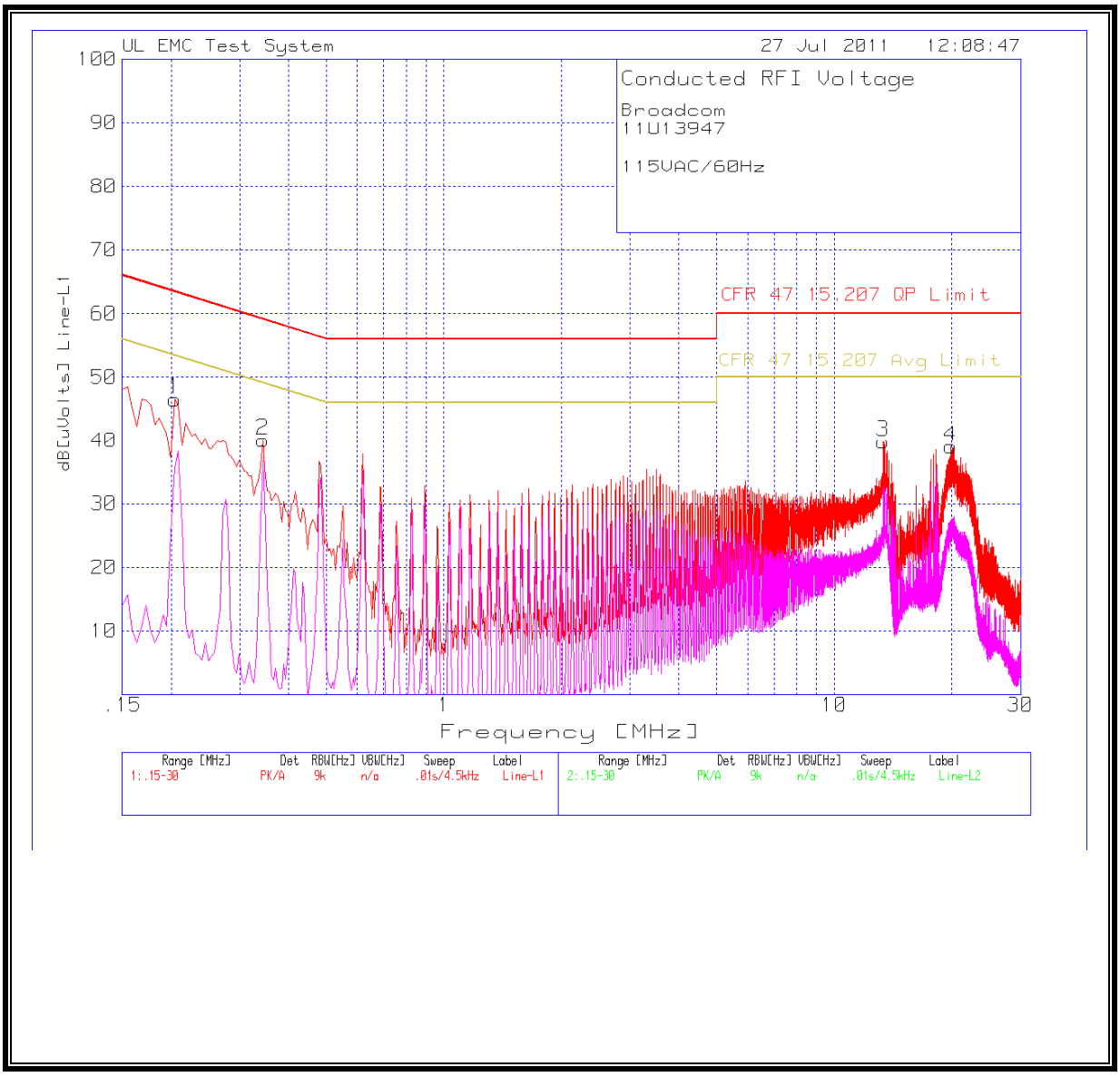
Test Frequency	Meter Reading	Detector	LISN [dB]	Conducted Emission Cable [dB]	dB[uVolts]	CFR 47 15.207 QP Limit	Margin	CFR 47 15.207 Avg Limit	Margin
0.204	46.52	PK	0	0	46.52	63.4	-16.88	53.4	-6.88
0.3435	40.03	PK	0	0	40.03	59.1	-19.07	49.1	-9.07
13.3575	39.84	PK	0	0	39.84	60	-20.16	50	-10.16
19.8825	38.97	PK	0	0	38.97	60	-21.03	50	-11.03

Line-L2 .15 - 30MHz

Test Frequency	Meter Reading	Detector	LISN [dB]	Conducted Emission Cable [dB]	dB[uVolts]	CFR 47 15.207 QP Limit	Margin	CFR 47 15.207 Avg Limit	Margin
0.204	48.38	PK	0	0	48.38	63.4	-15.02	53.4	-5.02
0.618	38.63	PK	0	0	38.63	56	-17.37	46	-7.37
13.479	39.81	PK	0	0	39.81	60	-20.19	50	-10.19
18.2445	40.15	PK	0	0	40.15	60	-19.85	50	-9.85

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

LINE 1 RESULTS



LINE 2 RESULTS