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

CERTIFICATION TEST REPORT

FOR

BD REMOTE CONTROL

MODEL NUMBER: CECH-ZRC1U

FCC ID: CWTASAZY102
IC: 1788F-ASAZY102

REPORT NUMBER: 10J13520-1

ISSUE DATE: JANUARY 25, 2011

Prepared for
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6-3-36, FURUKAWANAKAZATO
OSAKI-CITY
MIYAGI-PREF, 989-6181, JAPAN

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	01/25/11	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ALPS ELECTRIC CO., LTD.
6-3-36, FURUKAWANAKAZATO, OSAKI-CITY
MIYAGI-PREF, 989-6181, JAPAN

EUT DESCRIPTION: BD REMOTE CONTROL

MODEL: CECH-ZRC1U

SERIAL NUMBER: 11

DATE TESTED: JANUARY 13-19, 2011

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
UL CCS

Tested By:

OLIVER SU
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

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

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 & IR Remote control unit, powered by battery.

The radio module is manufactured by CSR.

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	4.15	2.60
2402 - 2480	DQPSK	3.51	1.00
2402 - 2480	Enhanced 8PSK	3.65	2.32

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes λ \4 PIFA antenna, with a maximum gain of -0.9 dBi.

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Bluetest, Btcli (BTM).

5.5. WORST-CASE CONFIGURATION AND MODE

The fundamental was measured in three different orientations X, Y and Z to find worst-case orientation, and it was found that Y orientation is worst-case; therefore final testing for radiated emissions was performed with EUT in Y orientation.

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

5.6. DESCRIPTION OF TEST SETUP

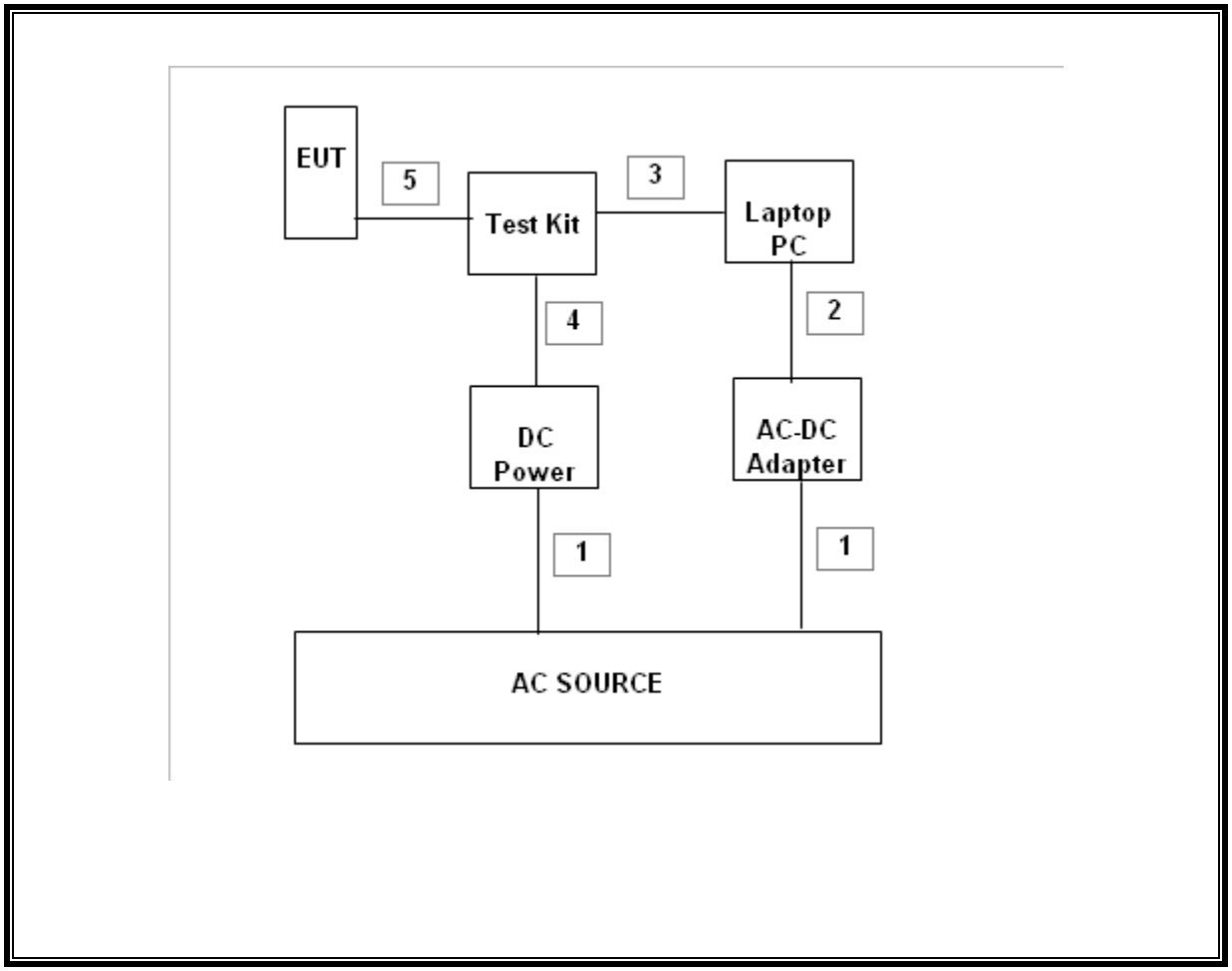
SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop PC	Toshiba	PSJ50N-0C4006	36017601H
AC/DC Adapter	Toshiba	PA3282U-2ACA	606
DC Power Supply	HP	6282A	2410A-04939
Test Kit	ALPS	Bluetooth Quick Tarter Kit 2	N/A

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC Input	2	AC	Un-Shielded	2m	N/A
2	DC Input	1	DC	Un-Shielded	1.7m	N/A
3	USB-RS232 Converter	1	USB-RS232	Shielded	0.6m	N/A
4	DC Input (2P)	1	DC	Un-Shielded	0.9m	N/A
5	DC Input (3P)	1	DC	Un-Shielded	0.3m	N/A

SETUP DIAGRAM FOR RADIATED 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**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	7/12/2011
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	7/11/2011
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	5/05/2011
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	07/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00945	06/29/11
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01179	08/18/11
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/30/11
Power Meter	Agilent / HP	438A	C01068	7/18/11
Reject Filter, 2.4-2.5 GHz	Micro-Tronics	BRM50702	N02685	CNR

7. ANTENNA PORT TEST RESULTS

7.1. BASIC DATA RATE GFSK MODULATION

7.1.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

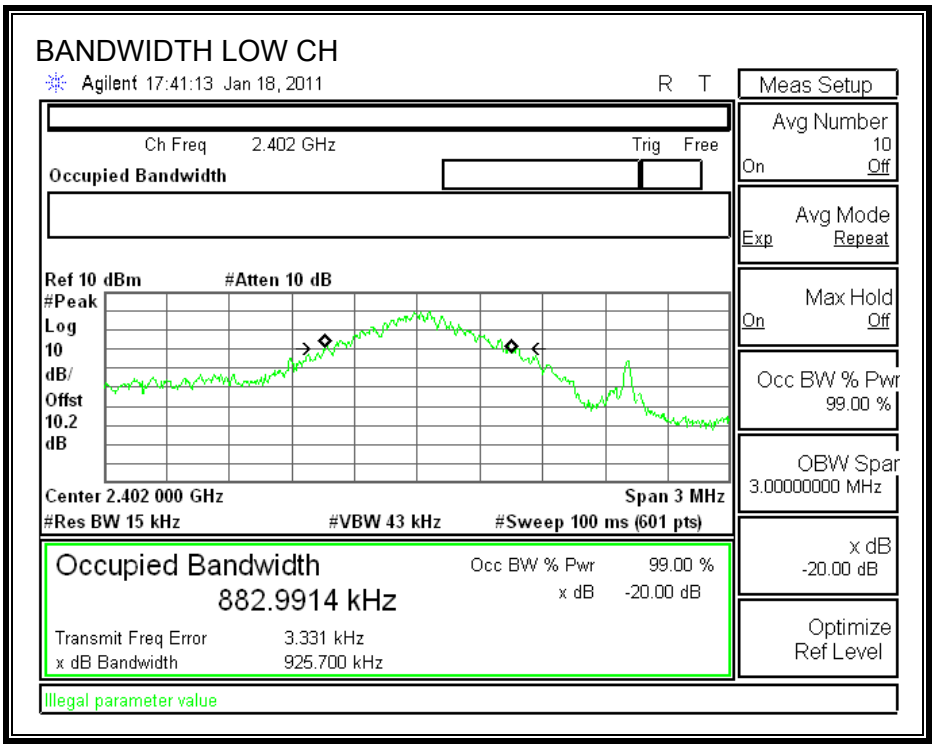
TEST PROCEDURE

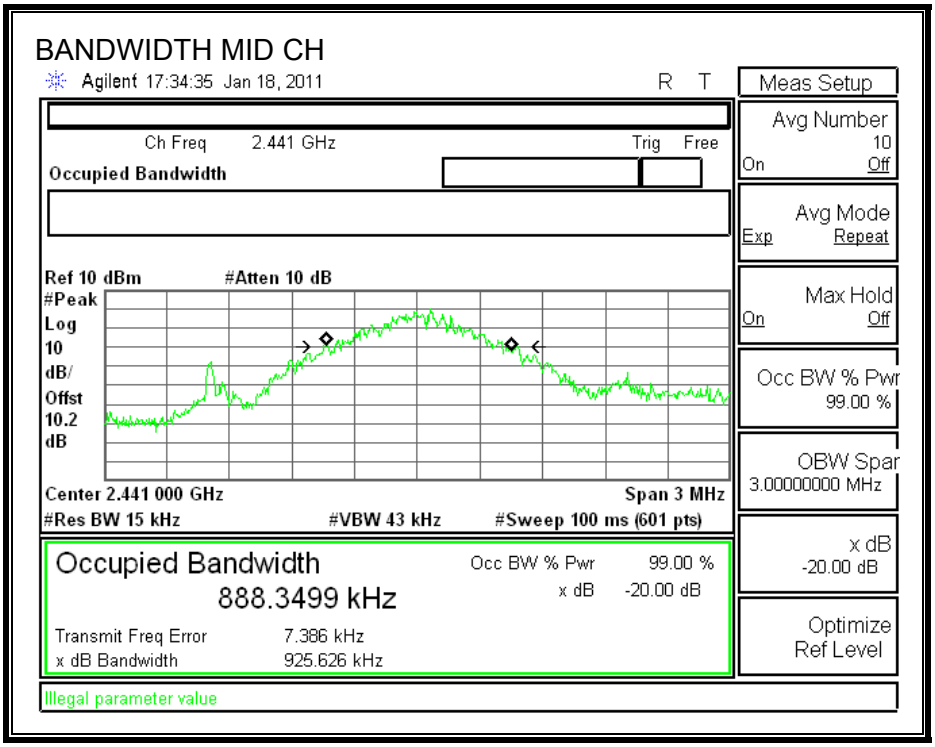
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

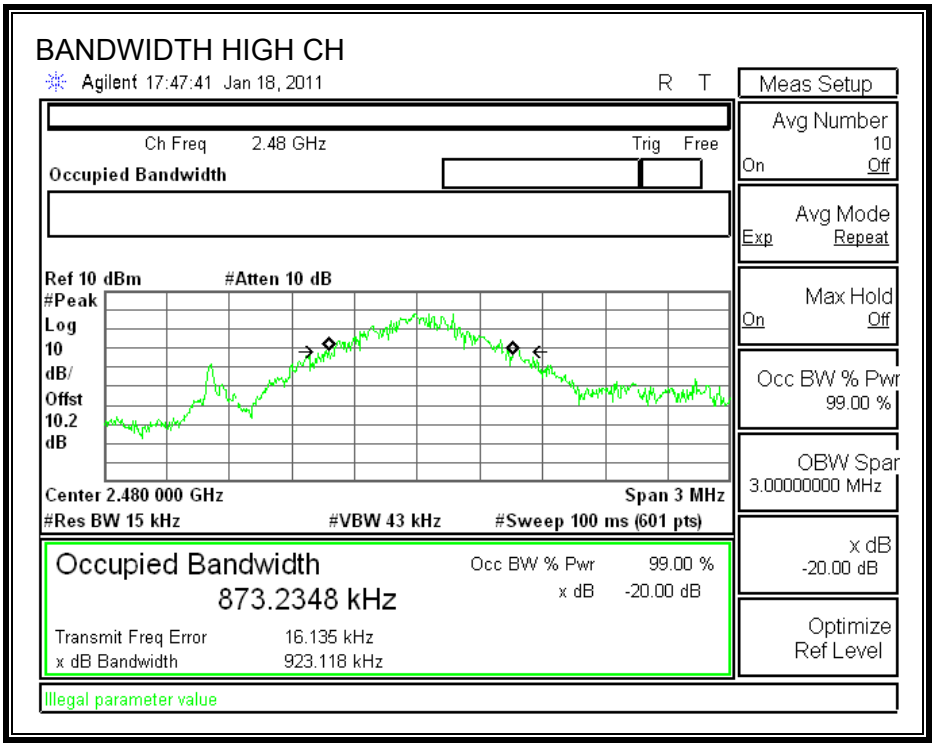
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	925.7	938.3961
Middle	2441	925.626	951.0308
High	2480	923.118	986.0936

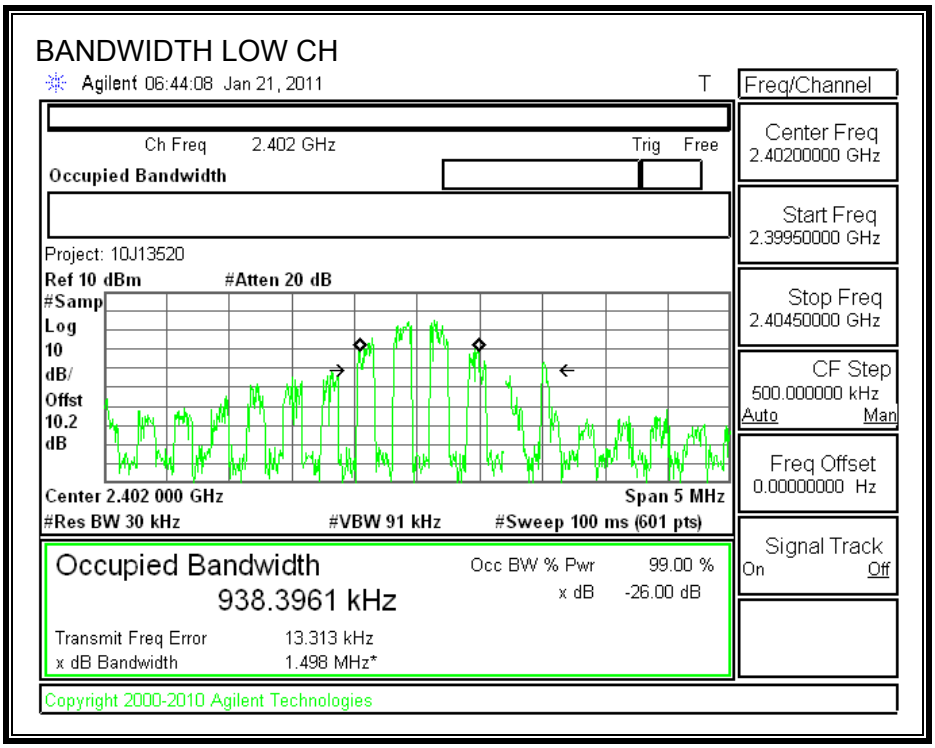
20 dB BANDWIDTH

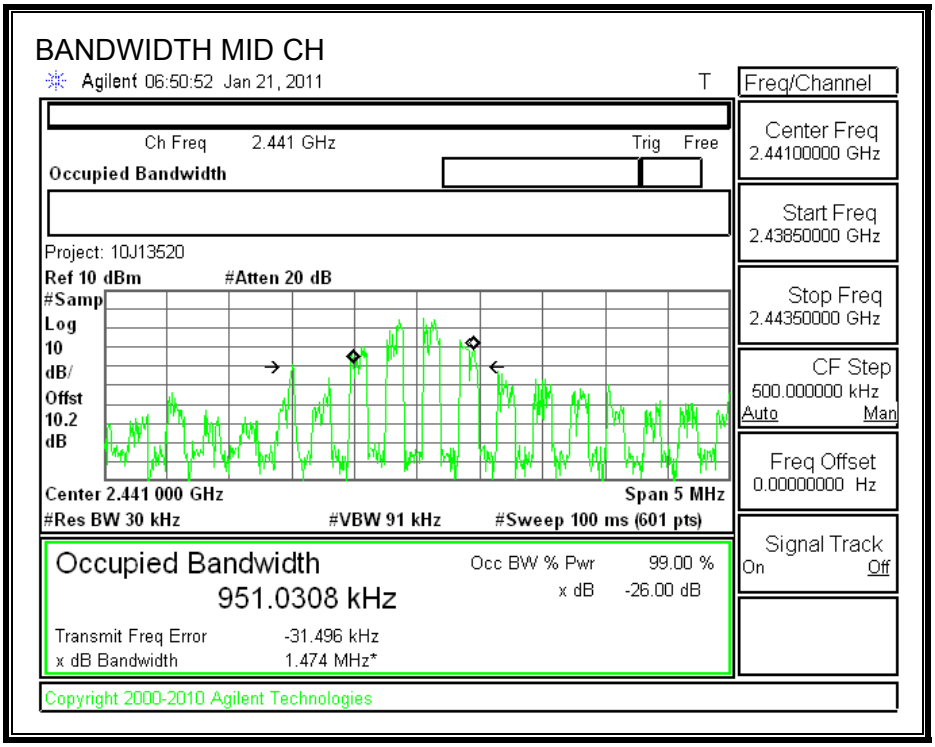


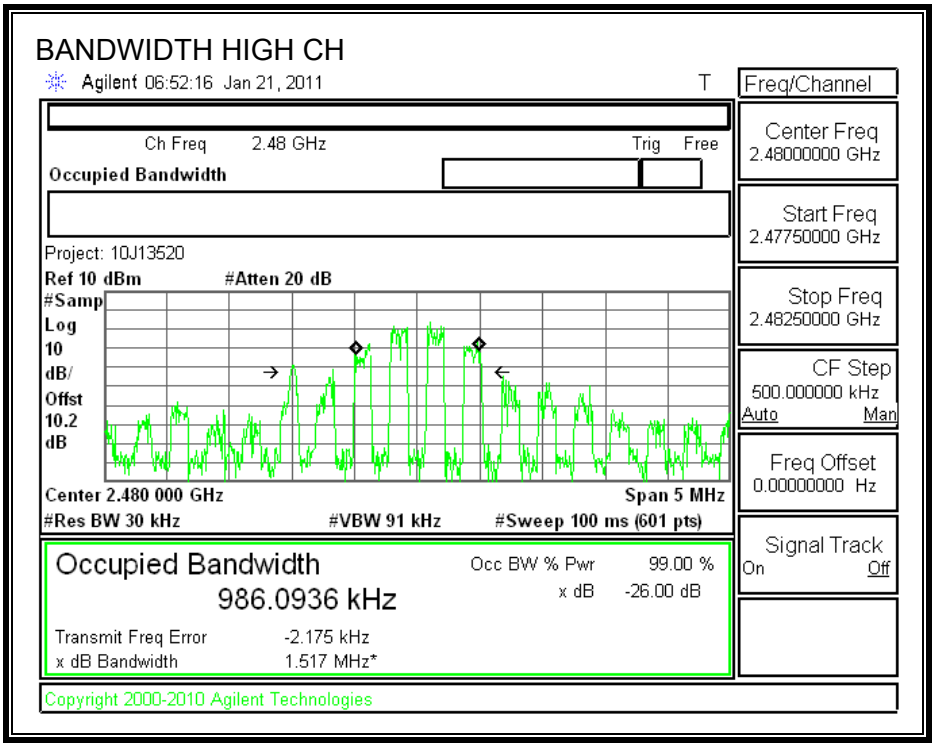




99% BANDWIDTH







7.1.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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

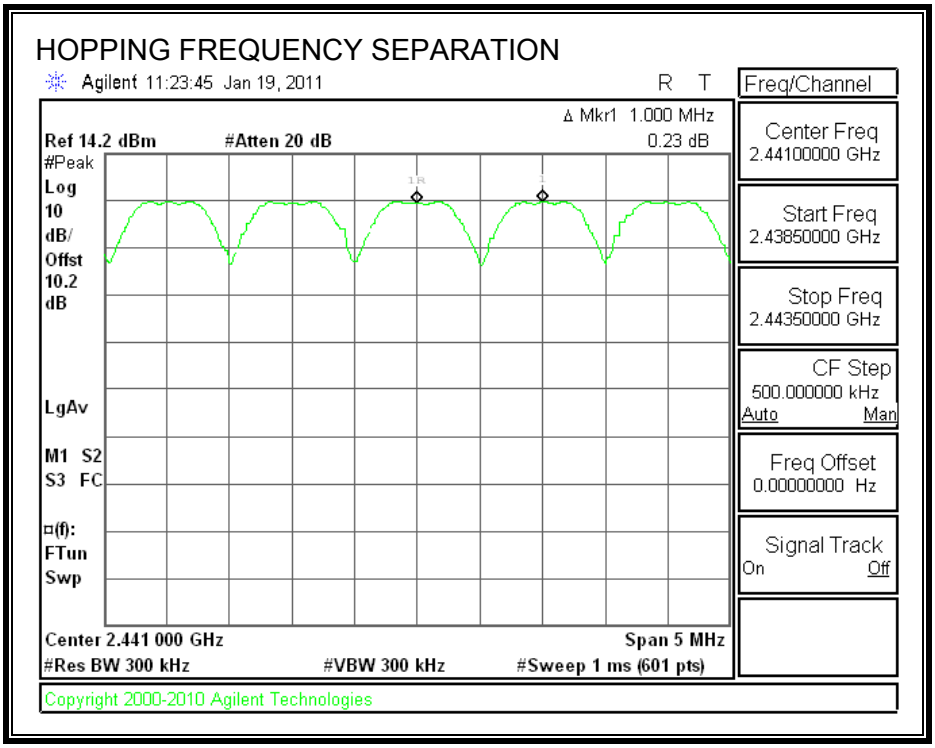
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION



7.1.3. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

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

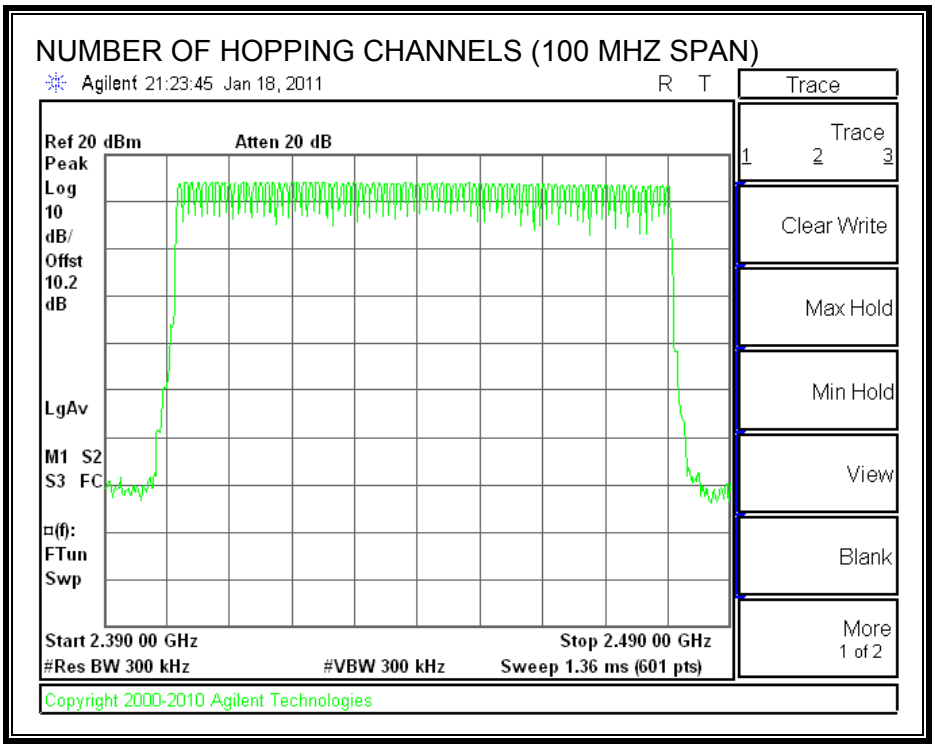
TEST PROCEDURE

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

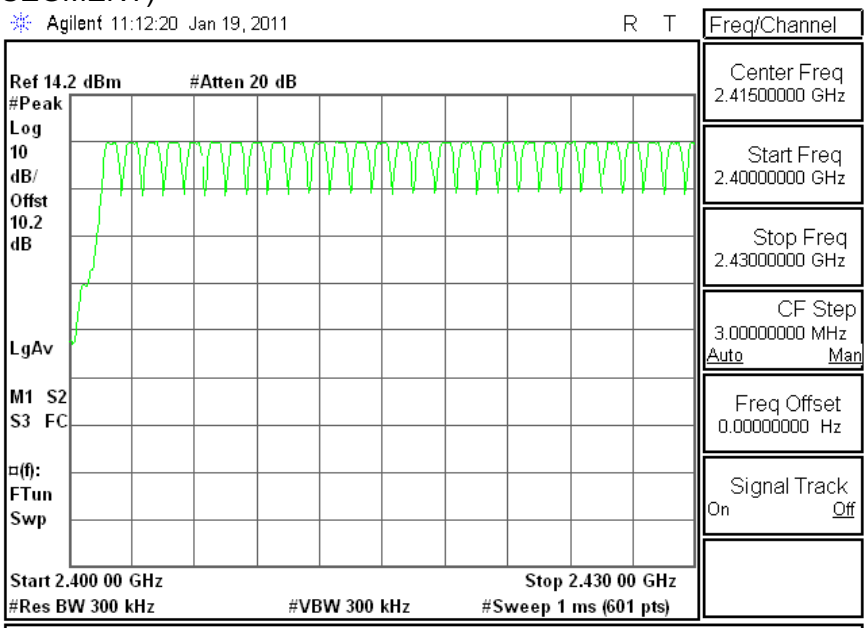
RESULTS

79 Channels observed.

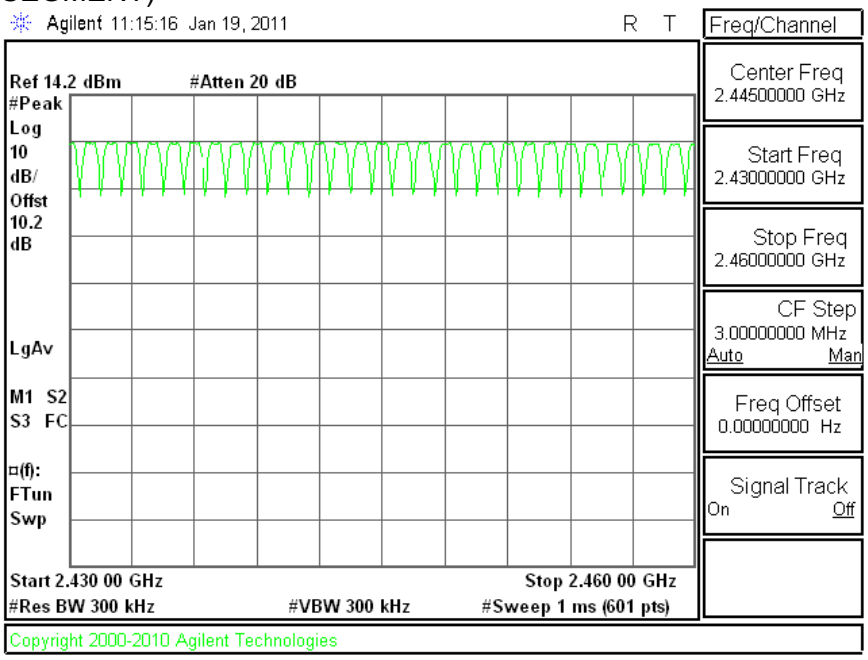
NUMBER OF HOPPING CHANNELS



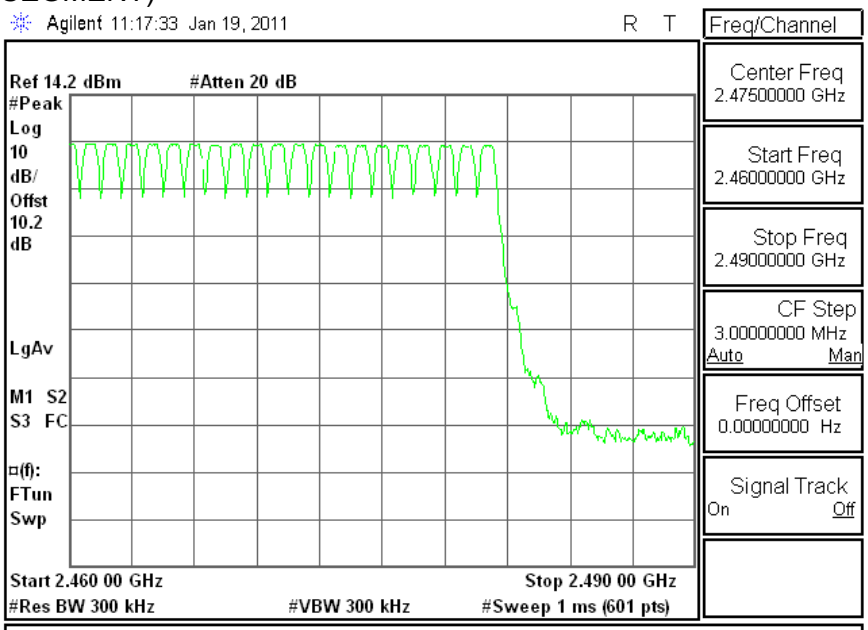
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

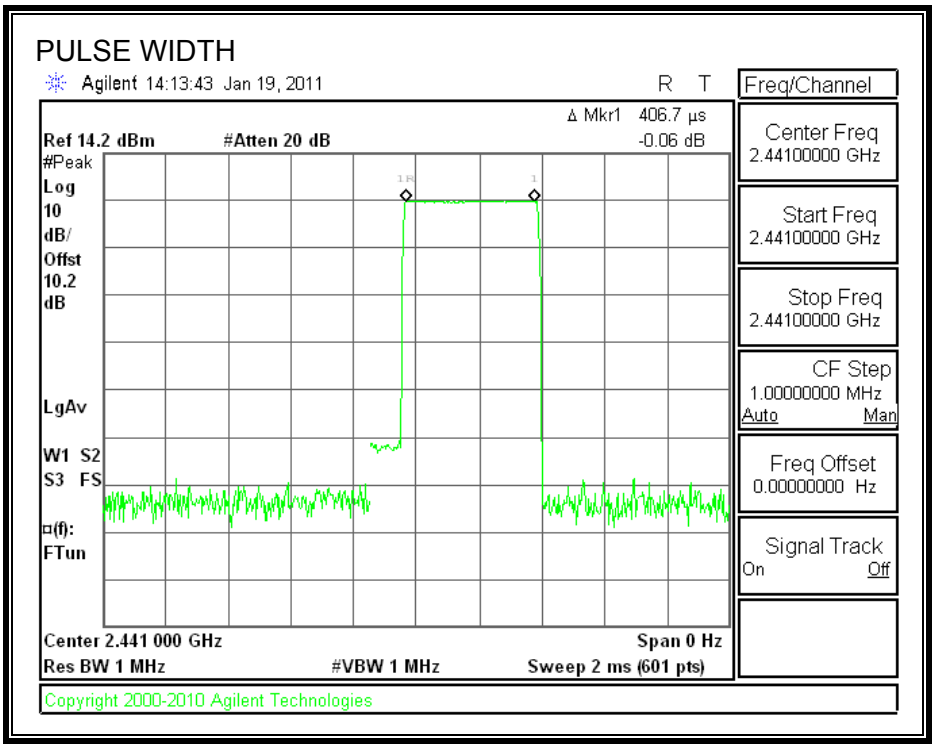
RESULTS

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

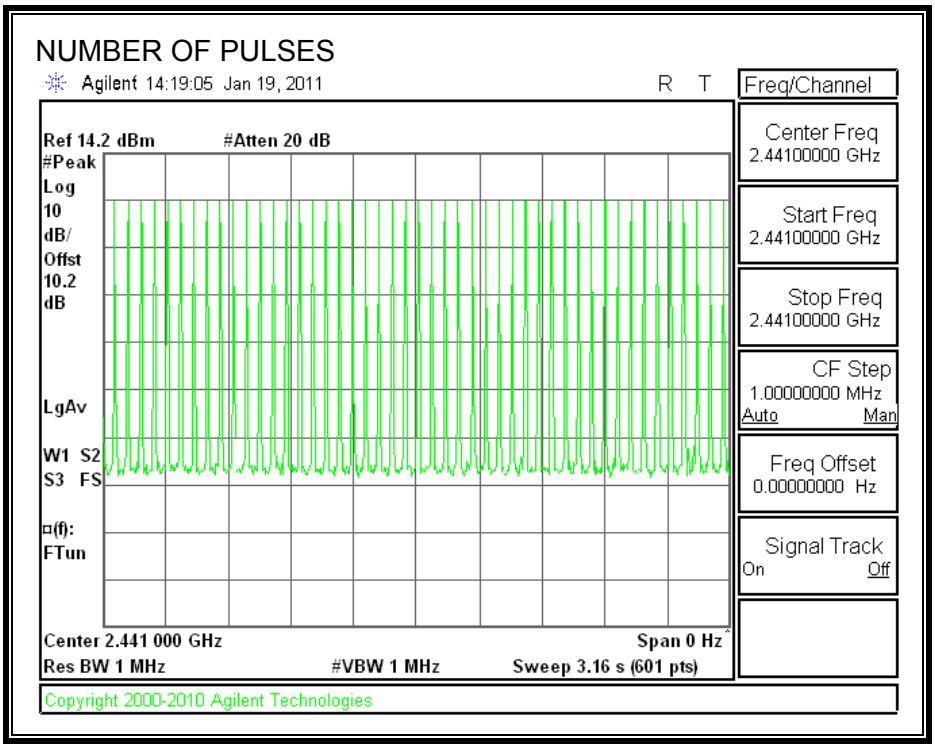
GFSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.4067	42	0.1708	0.4	0.2292
DH3	1.6000	12	0.1920	0.4	0.2080
DH5	2.9330	7	0.2053	0.4	0.1947

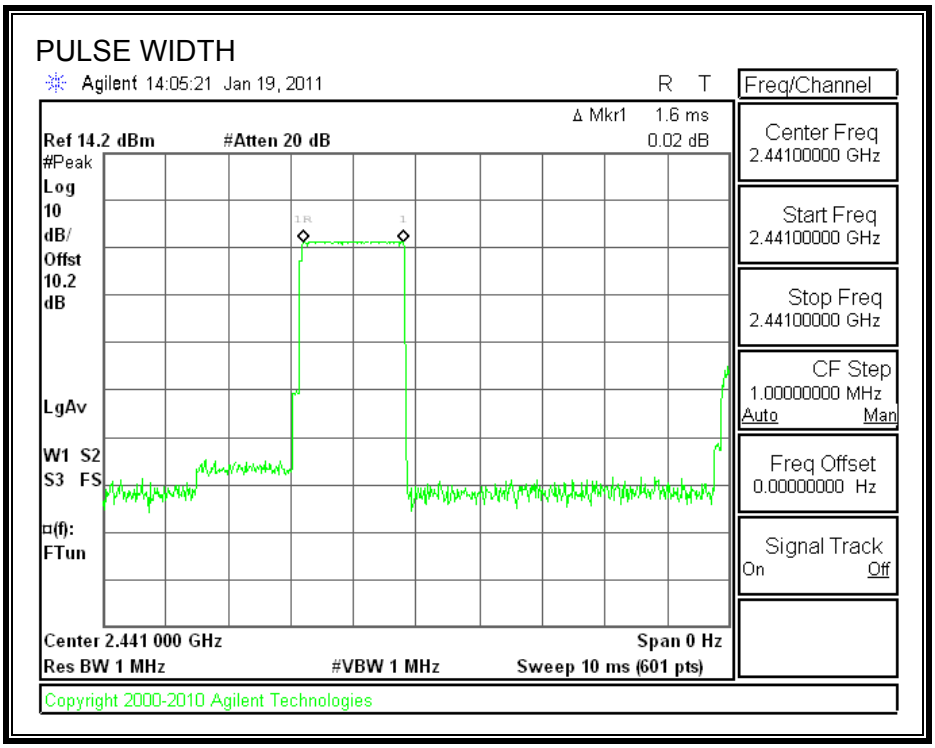
DH1 PULSE WIDTH



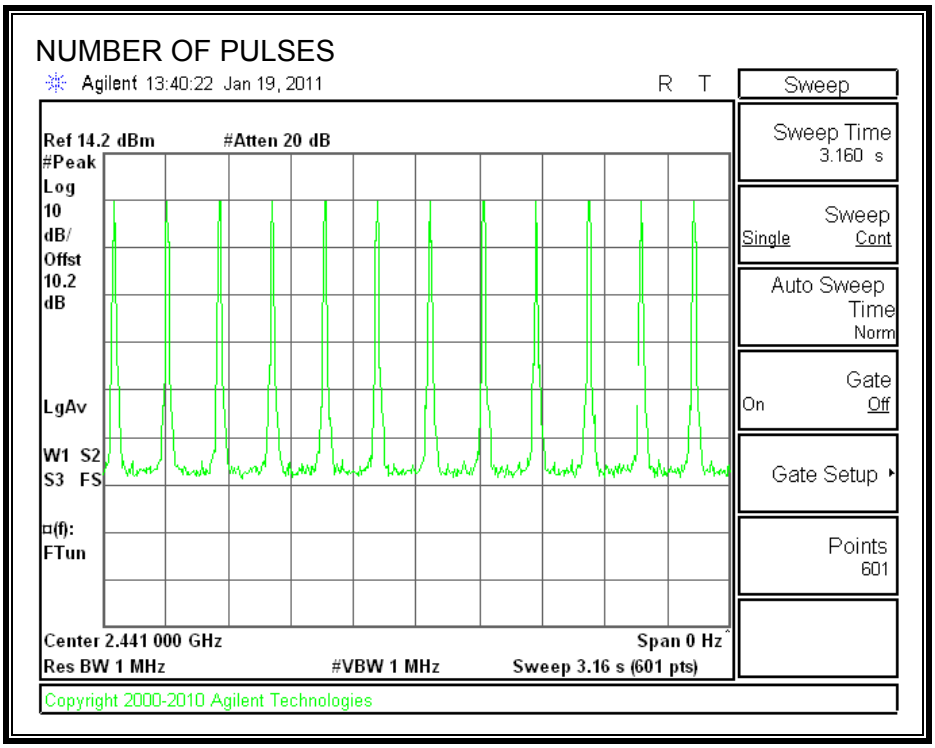
DH1 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



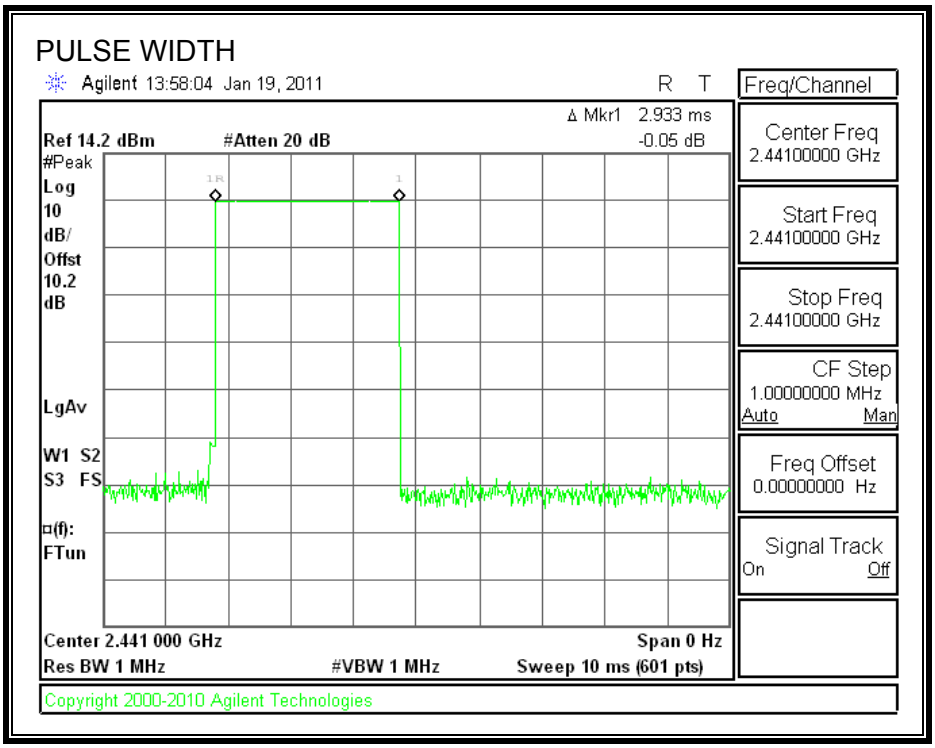
DH3 PULSE WIDTH



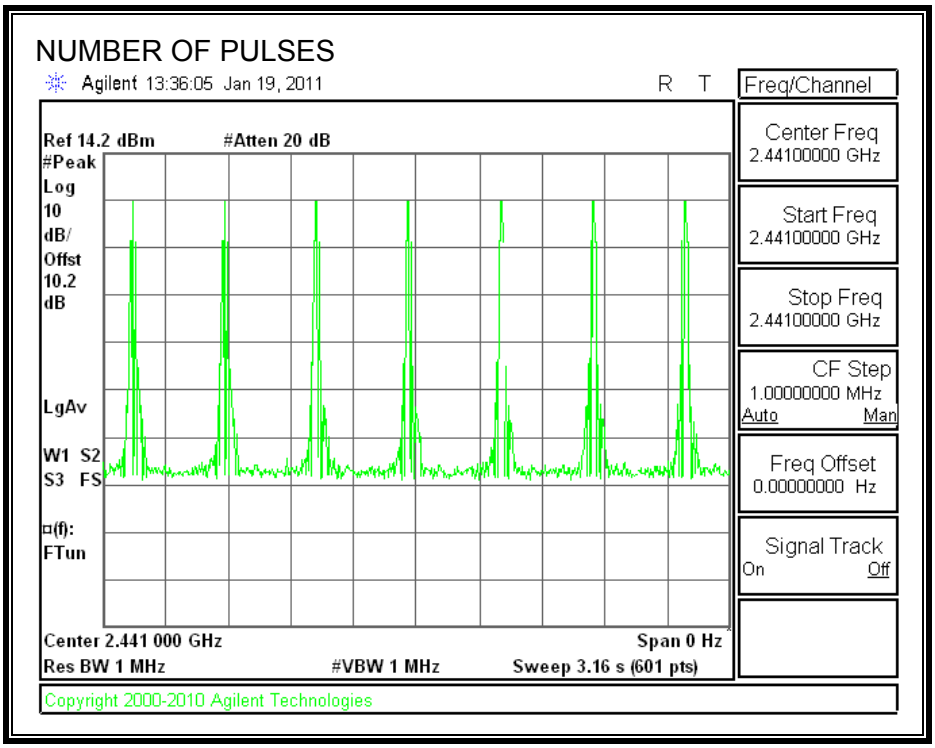
DH3 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



DH5 PULSE WIDTH



DH5 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.1.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

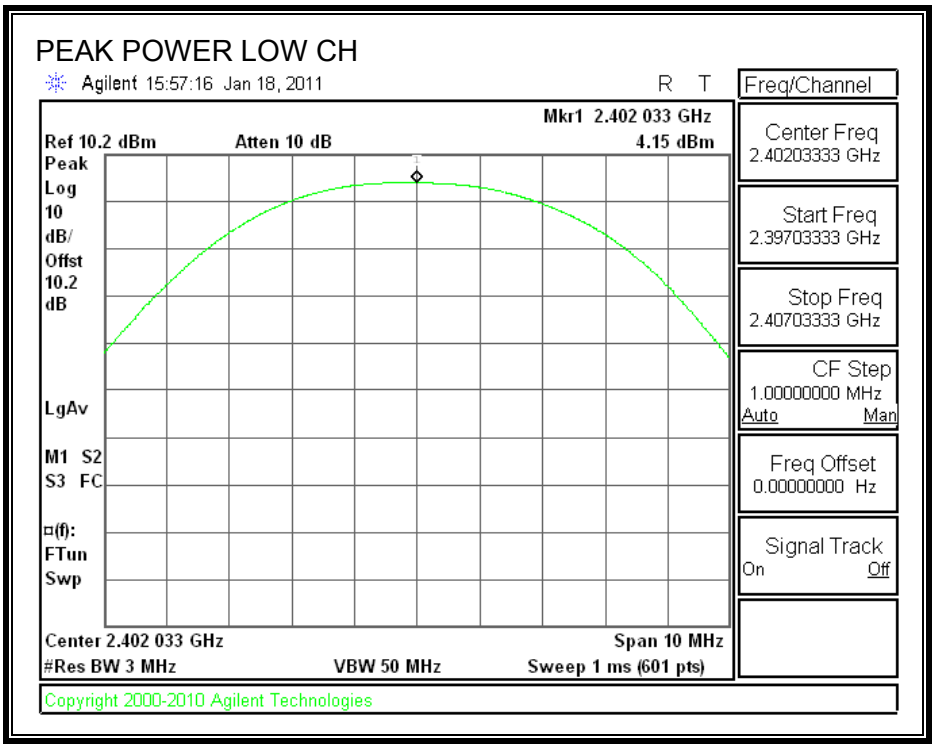
TEST PROCEDURE

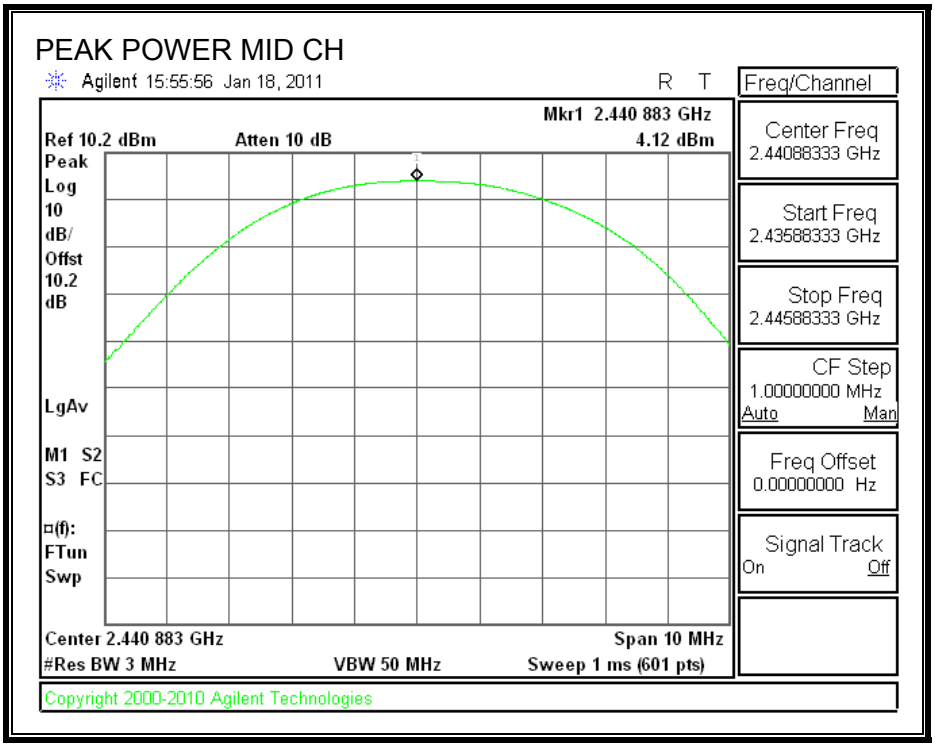
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

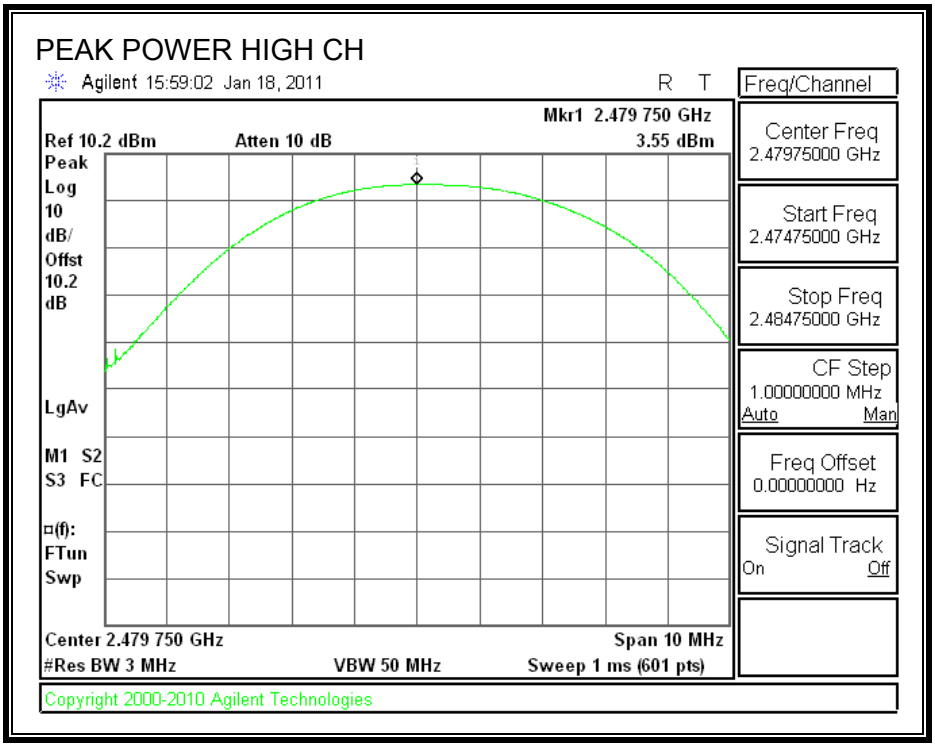
RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	4.15	30	-25.85
Middle	2441	4.12	30	-25.88
High	2480	3.55	30	-26.45

OUTPUT POWER







7.1.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.2 dB (including 10 dB pad and 0.2 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	1.00
Middle	2441	0.94
High	2480	0.39

7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

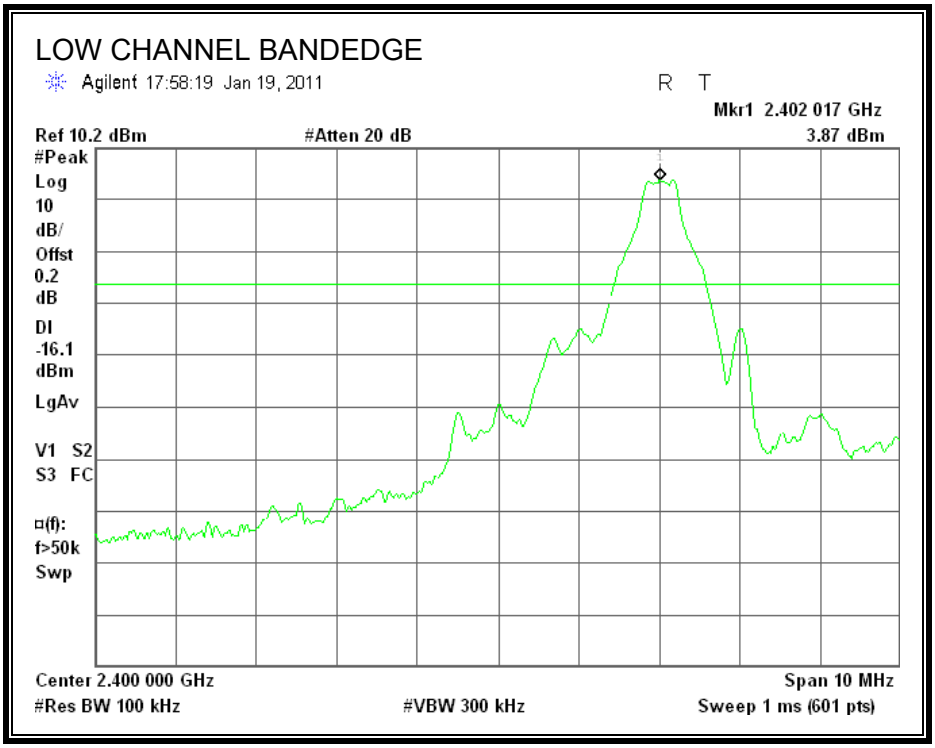
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

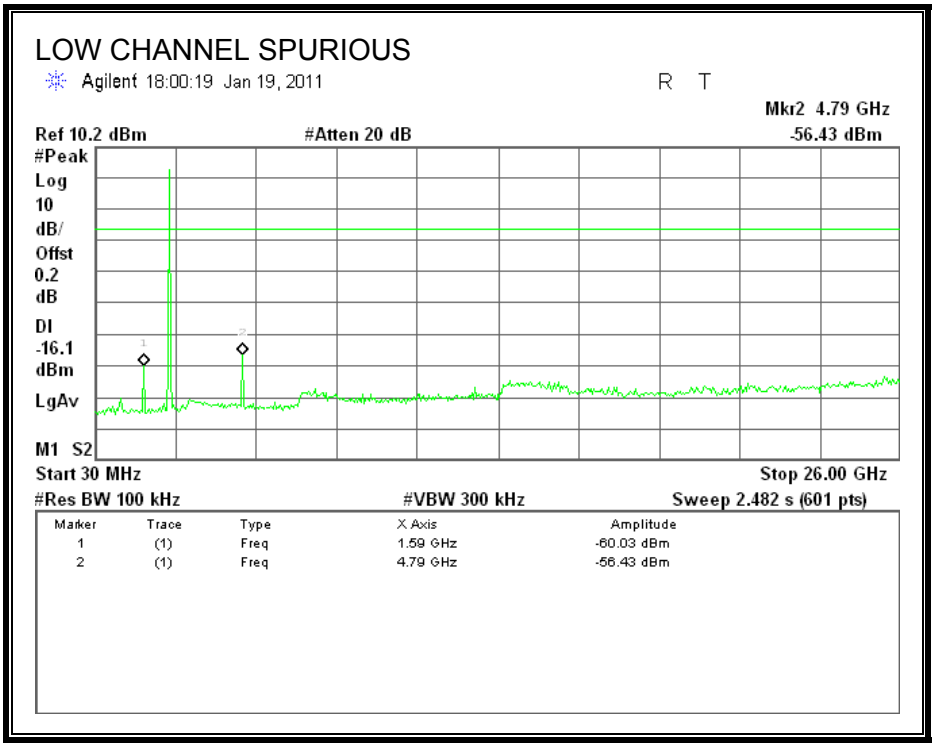
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

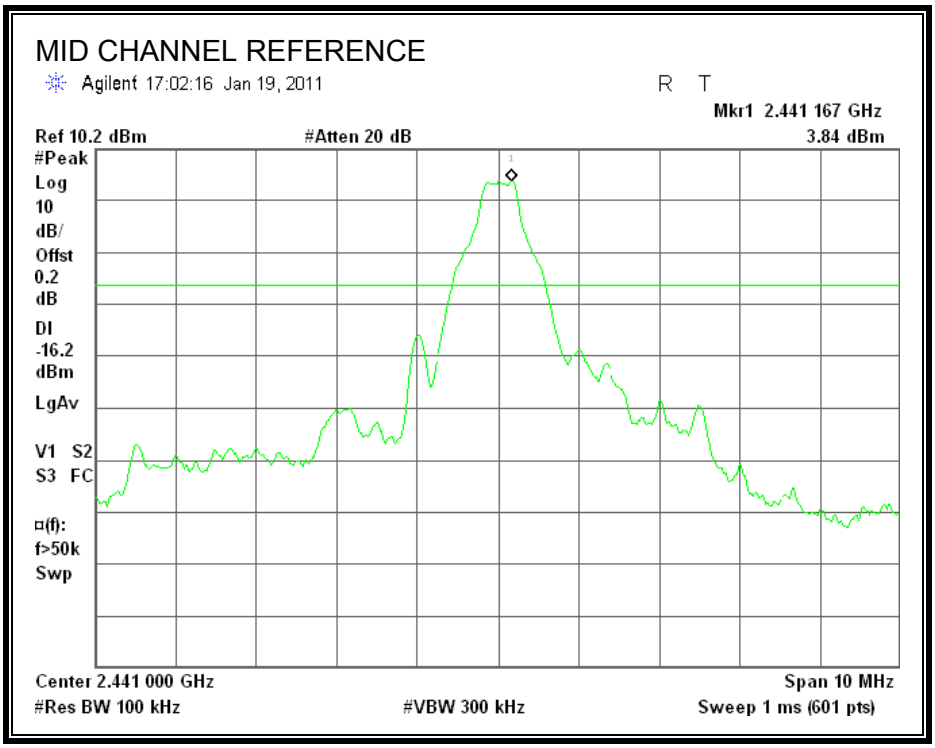
RESULTS

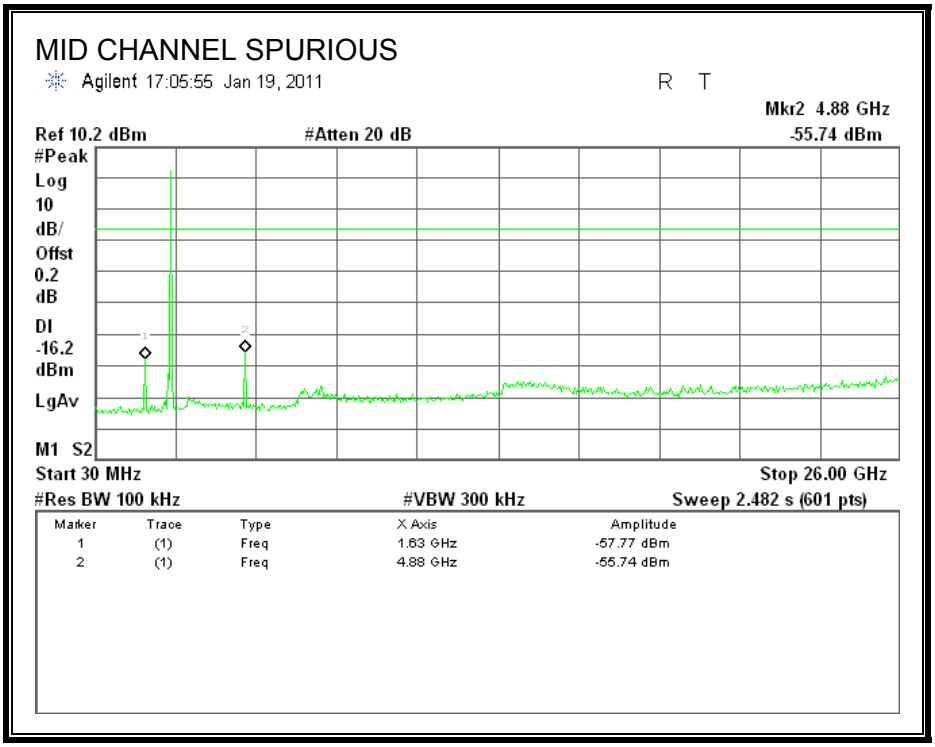
SPURIOUS EMISSIONS, LOW CHANNEL



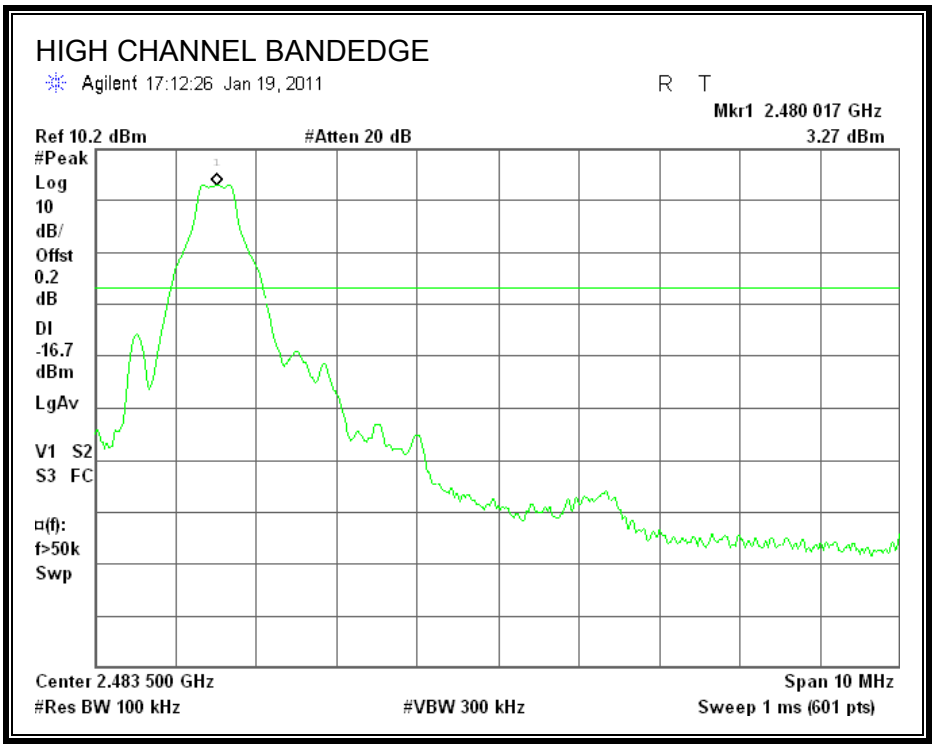


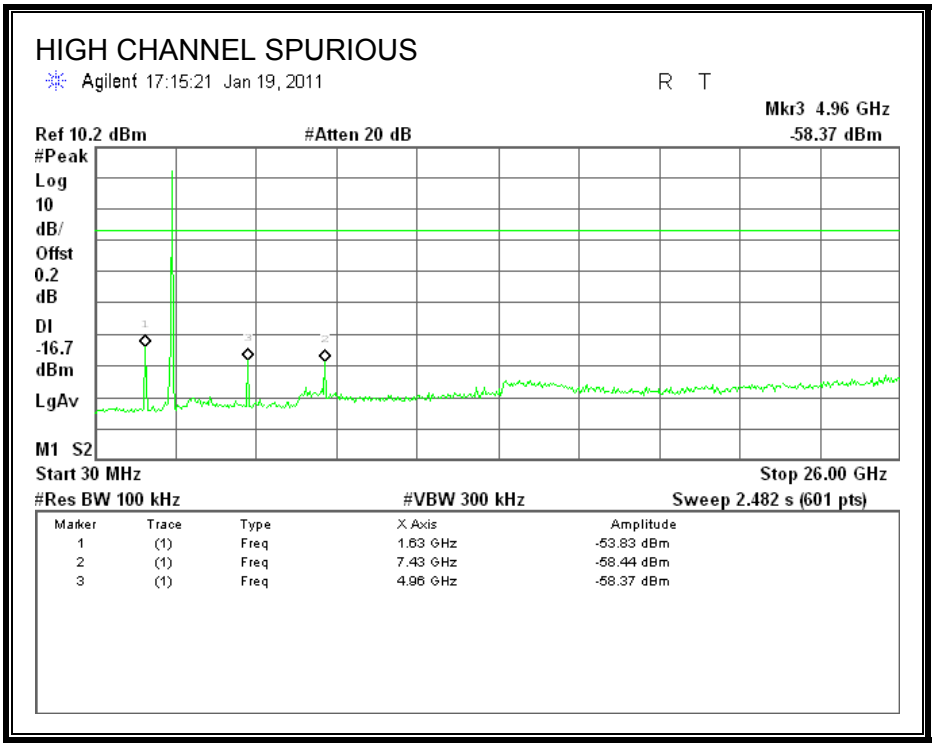
SPURIOUS EMISSIONS, MID CHANNEL



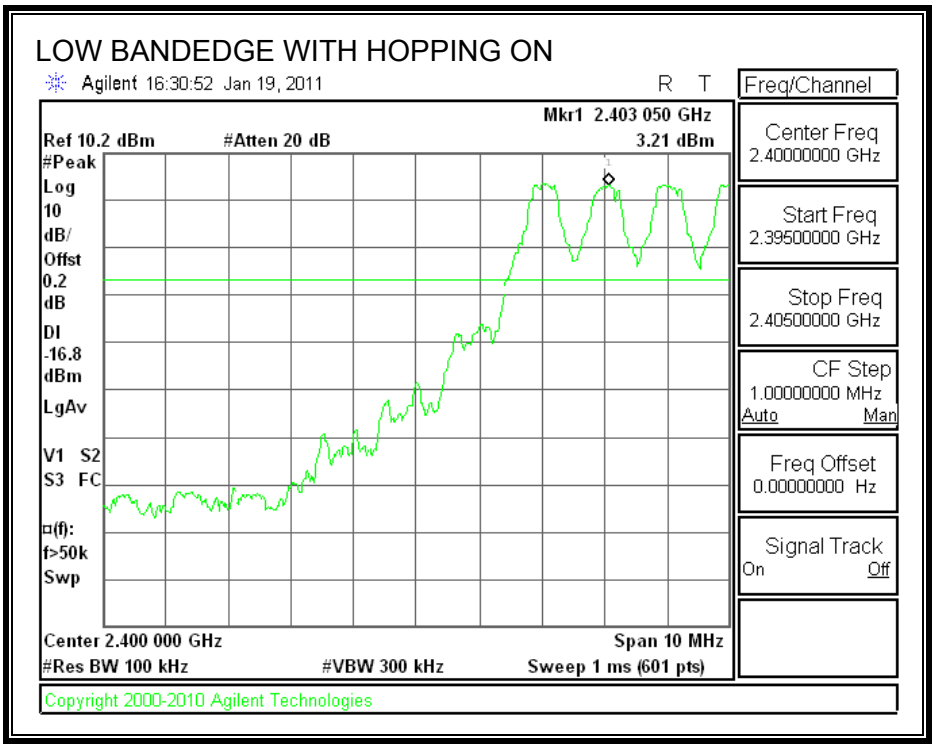


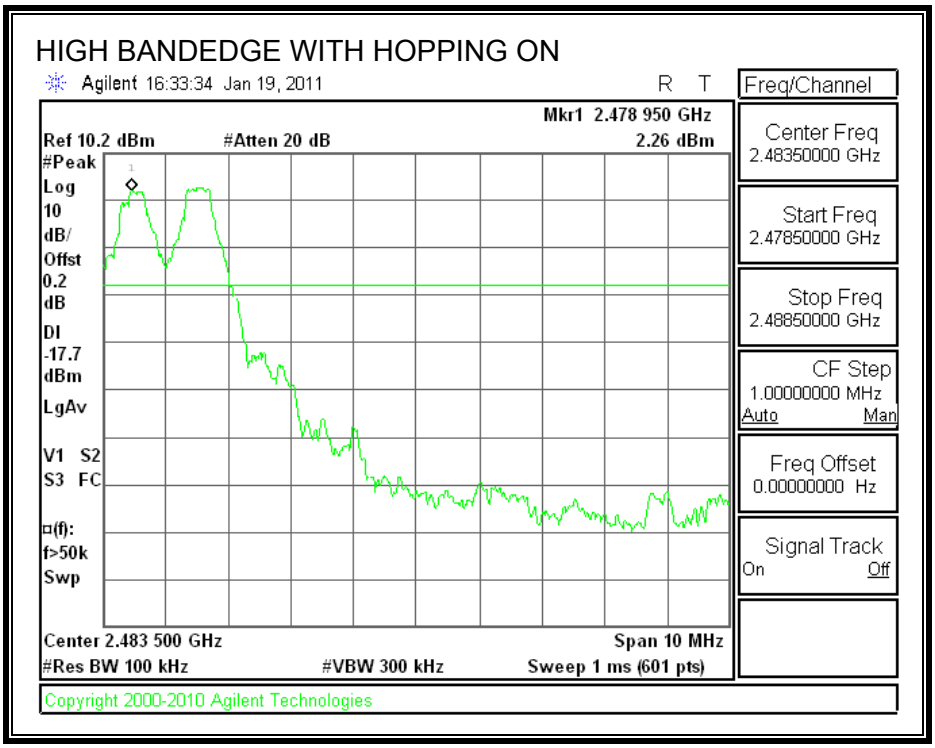
SPURIOUS EMISSIONS, HIGH CHANNEL





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

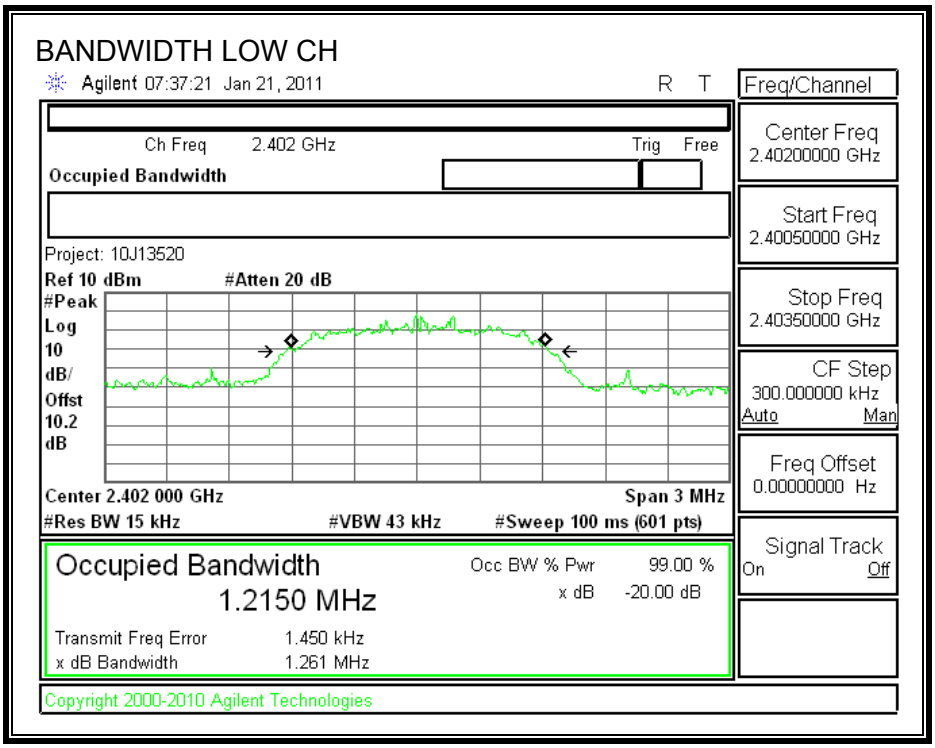
TEST PROCEDURE

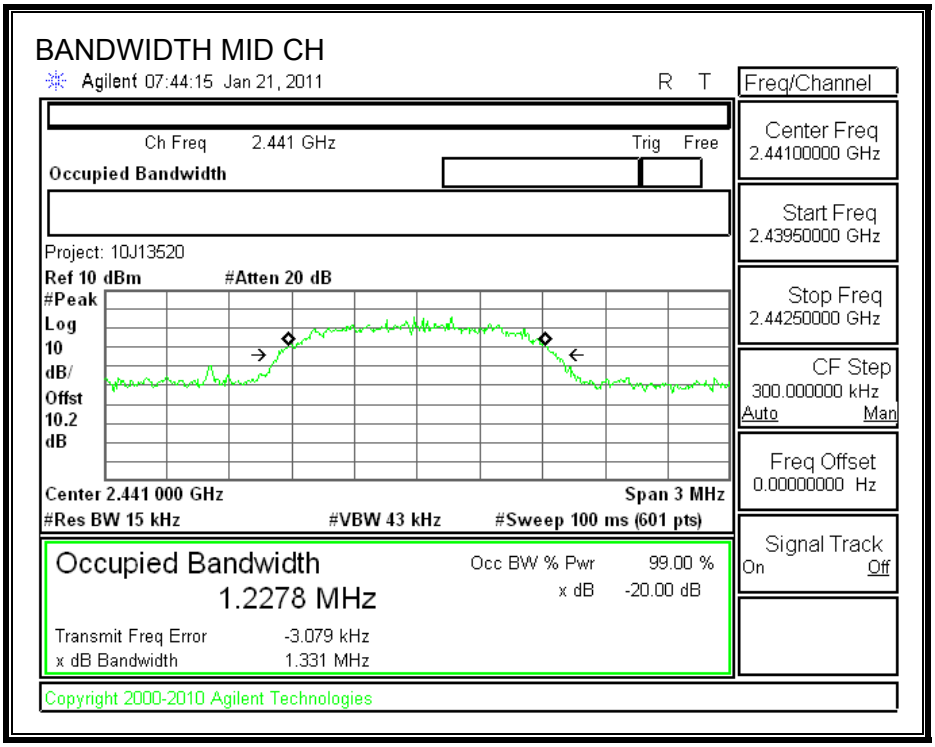
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

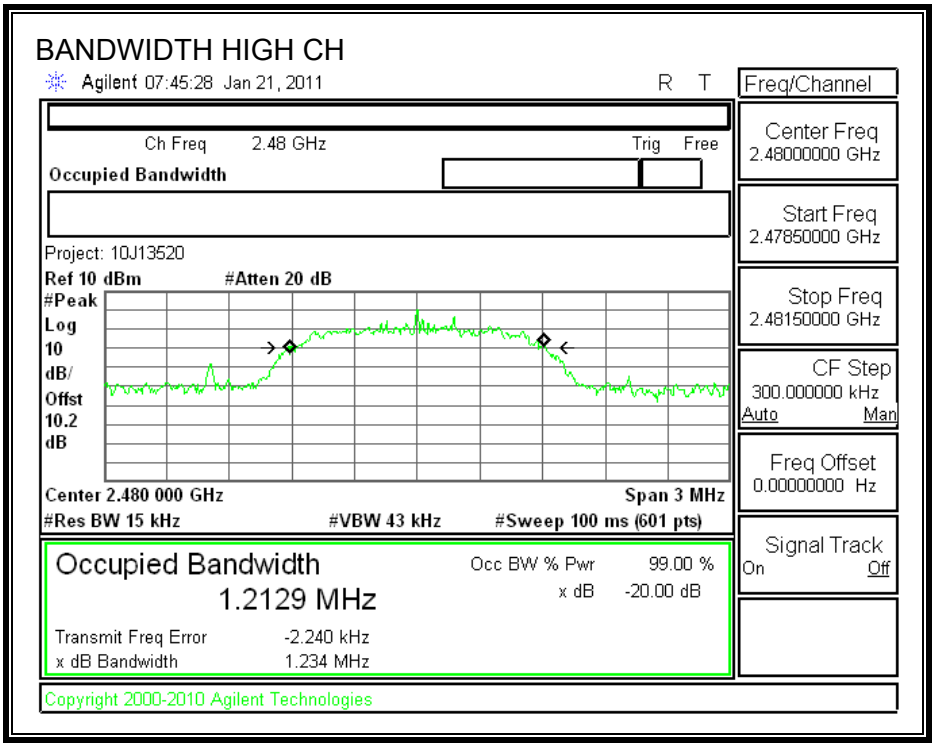
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	1261	1264.3
Middle	2441	1331	1266
High	2480	1234	1245.7

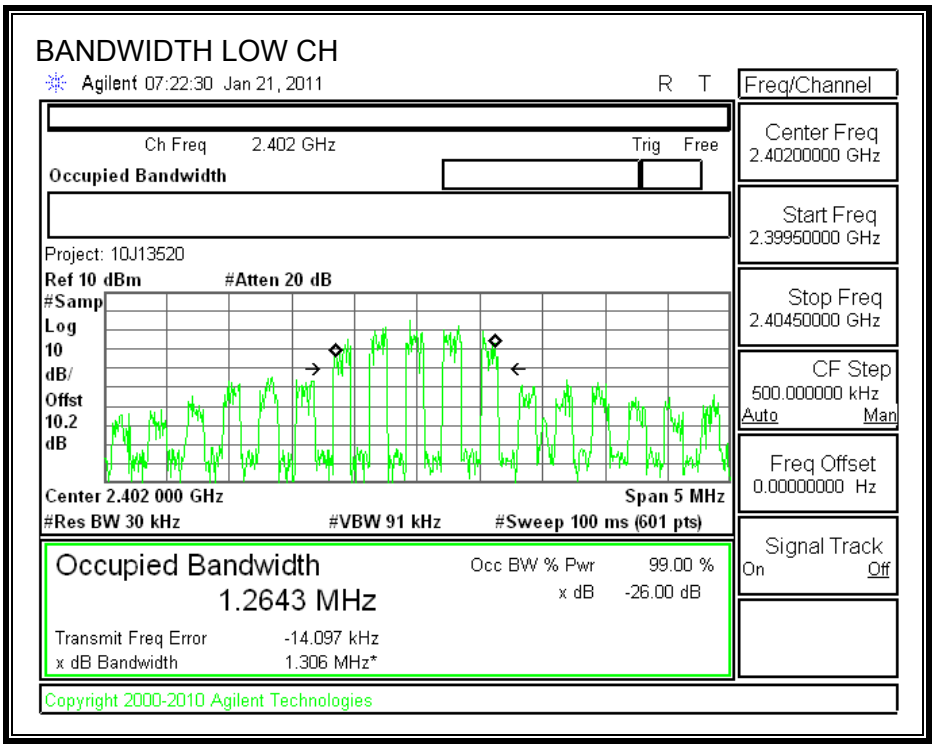
20 dB BANDWIDTH

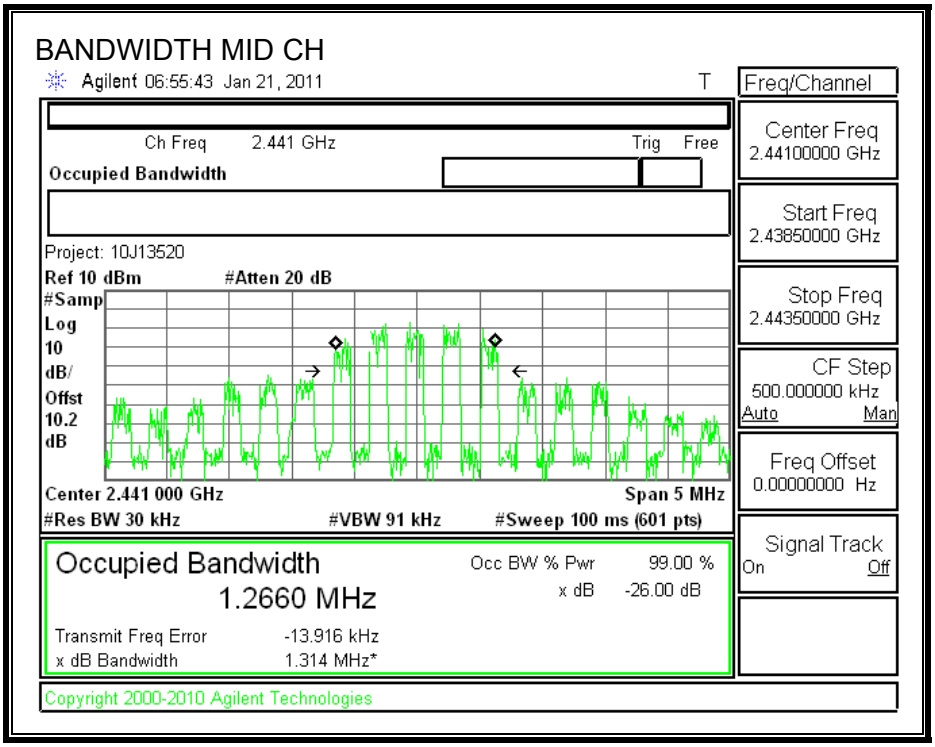


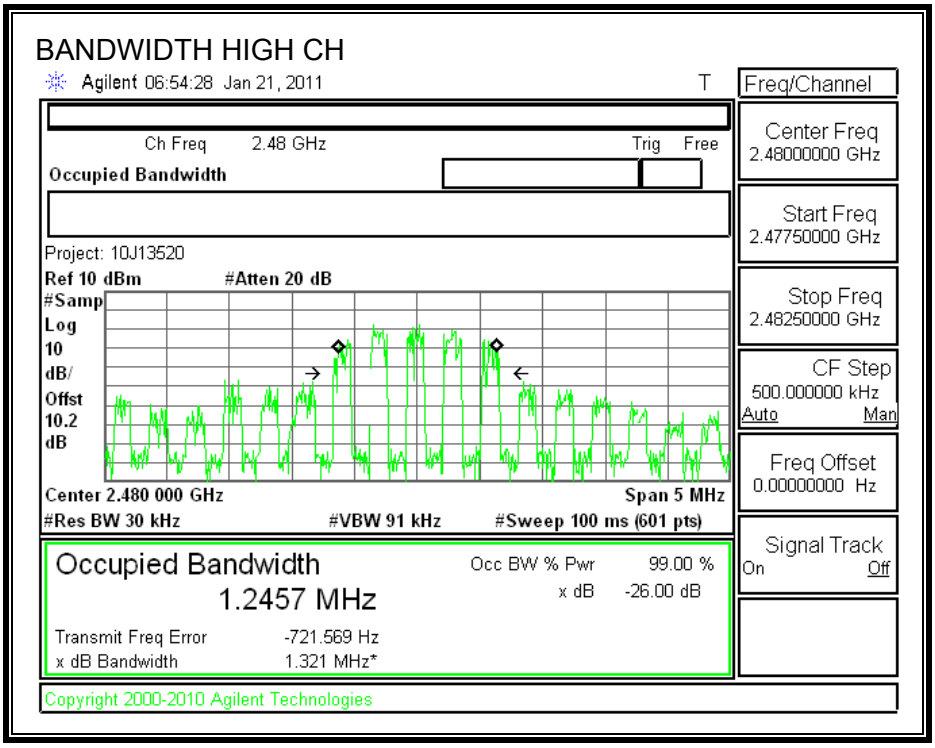




99% BANDWIDTH







7.2.2. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-210 A8.1 (b)

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

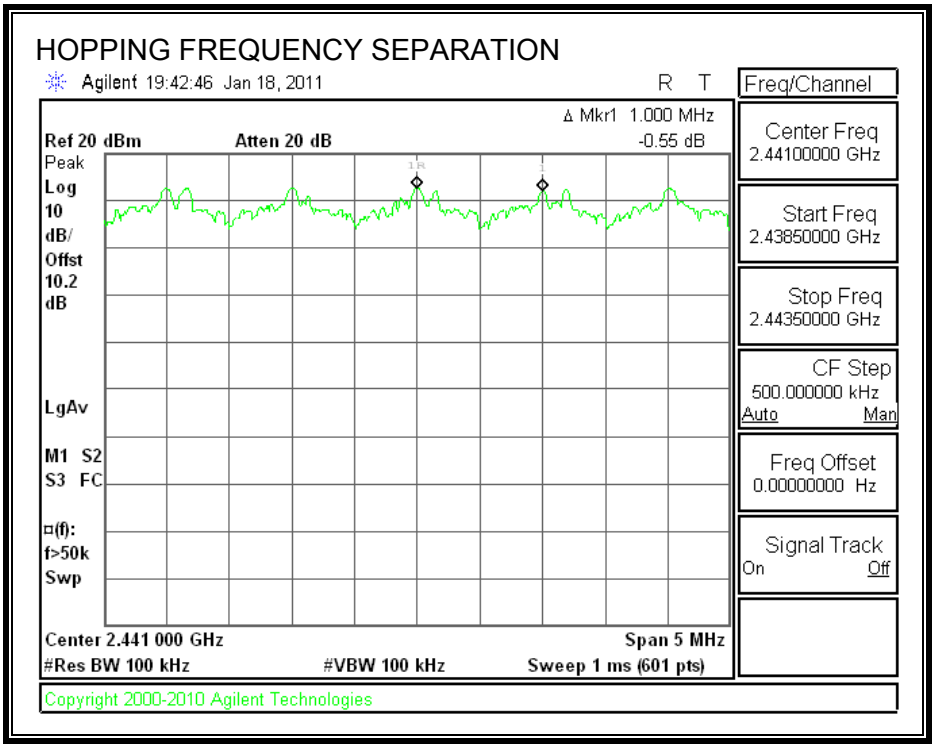
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

IC RSS-210 A8.1 (d)

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

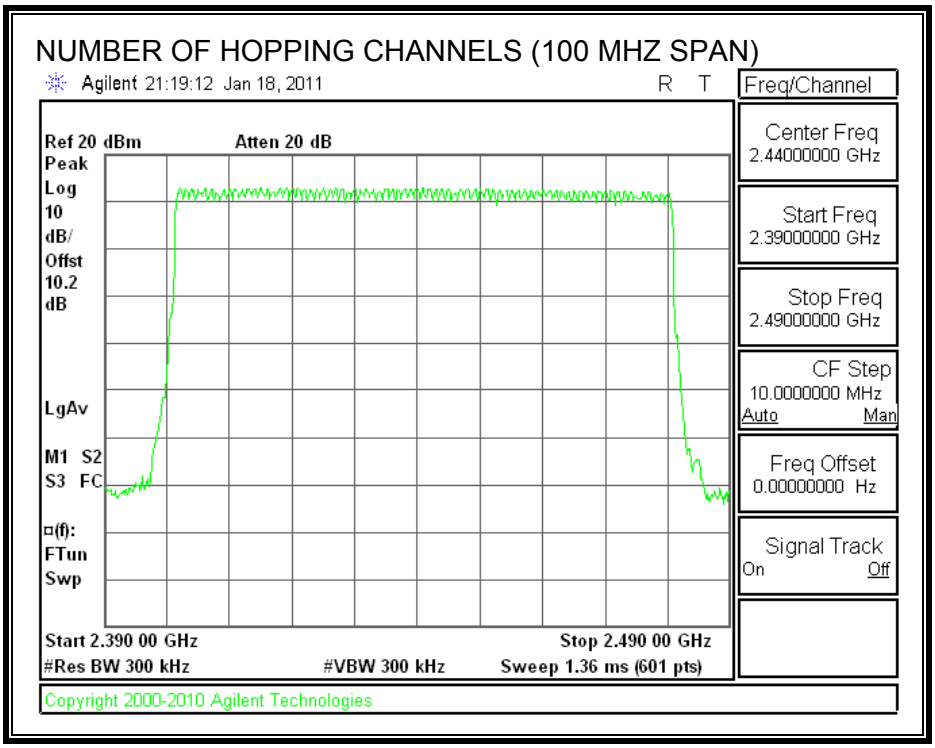
TEST PROCEDURE

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.

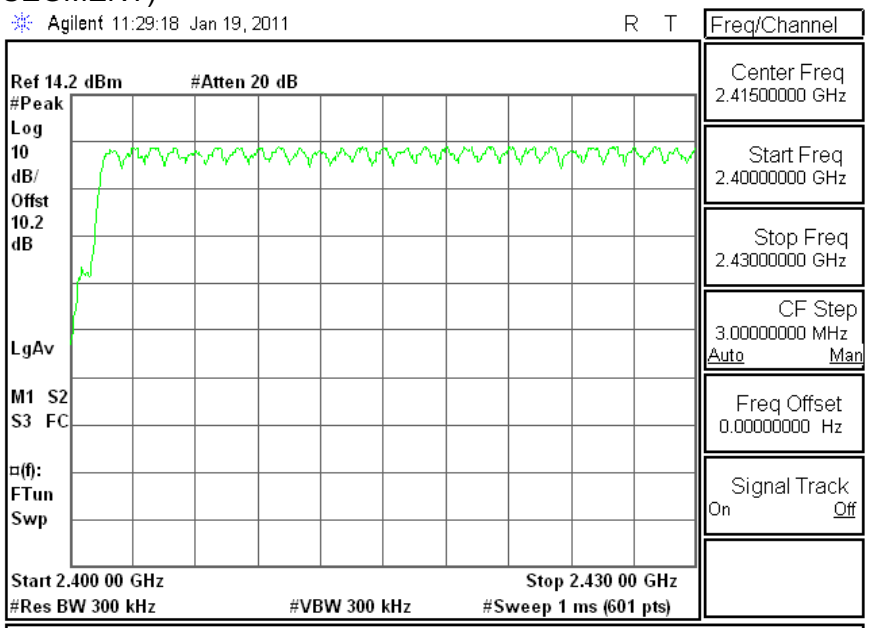
RESULTS

79 Channels observed.

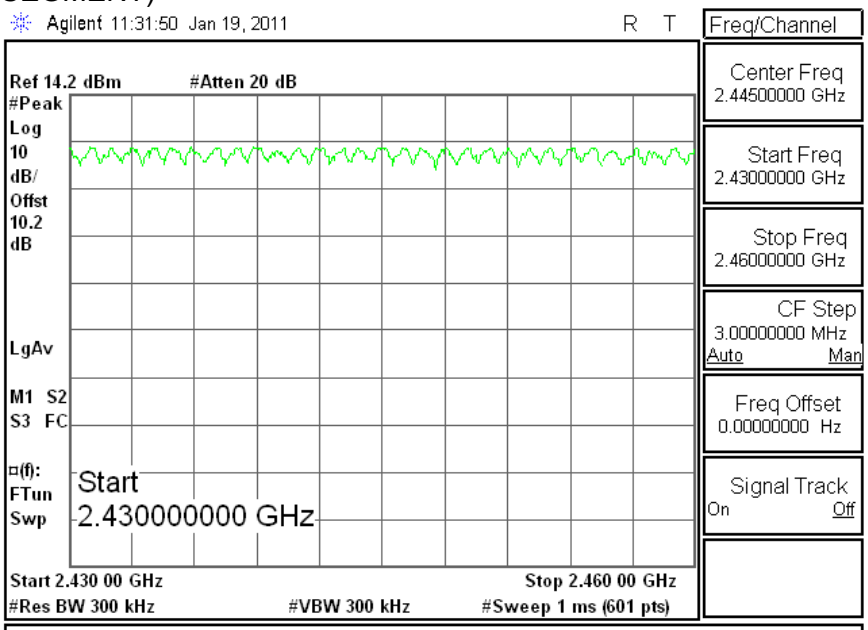
NUMBER OF HOPPING CHANNELS



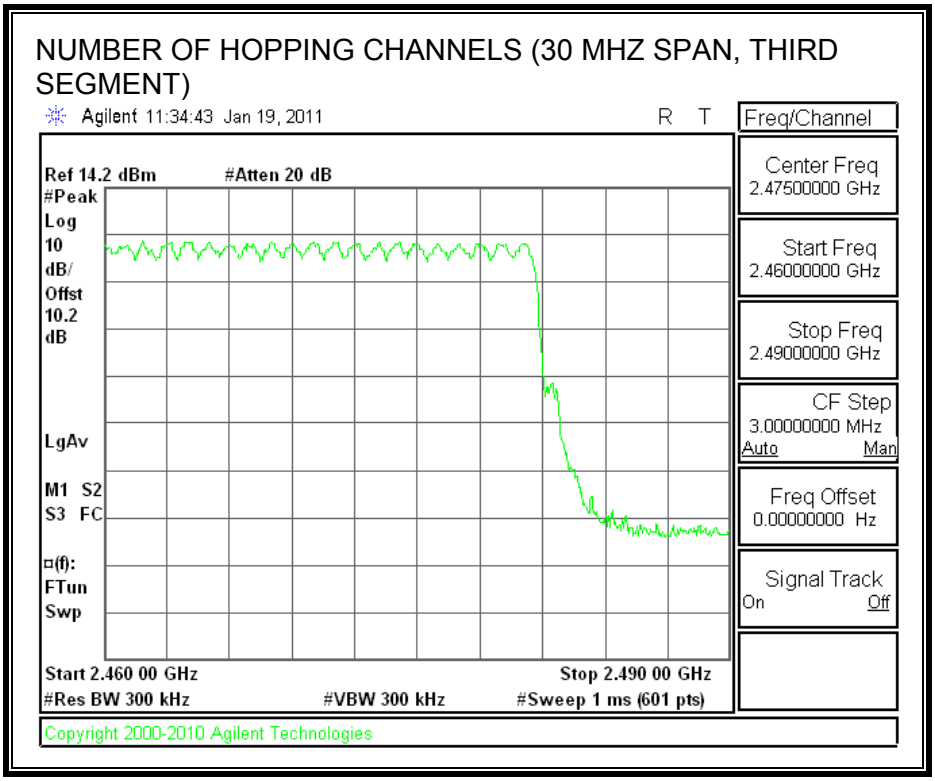
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



7.2.4. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-210 A8.1 (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

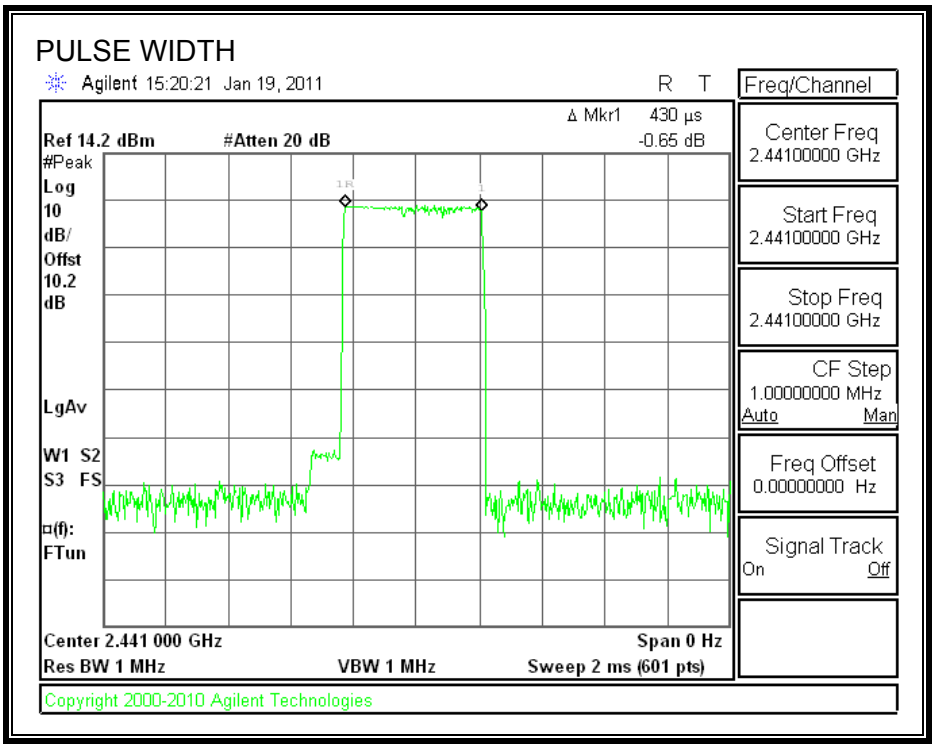
RESULTS

Time of Occupancy = 10 * xx pulses * yy msec = zz msec

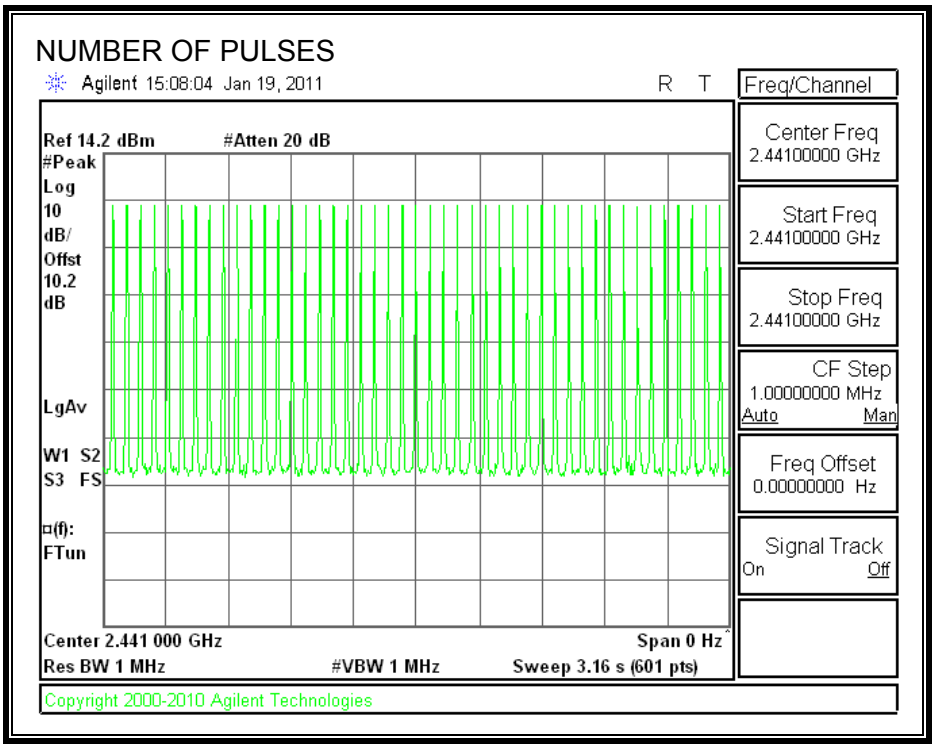
8PSK Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
3DH1	0.43	45	0.194	0.4	0.207
3DH3	1.675	12	0.201	0.4	0.199
3DH5	2.917	7	0.204	0.4	0.196

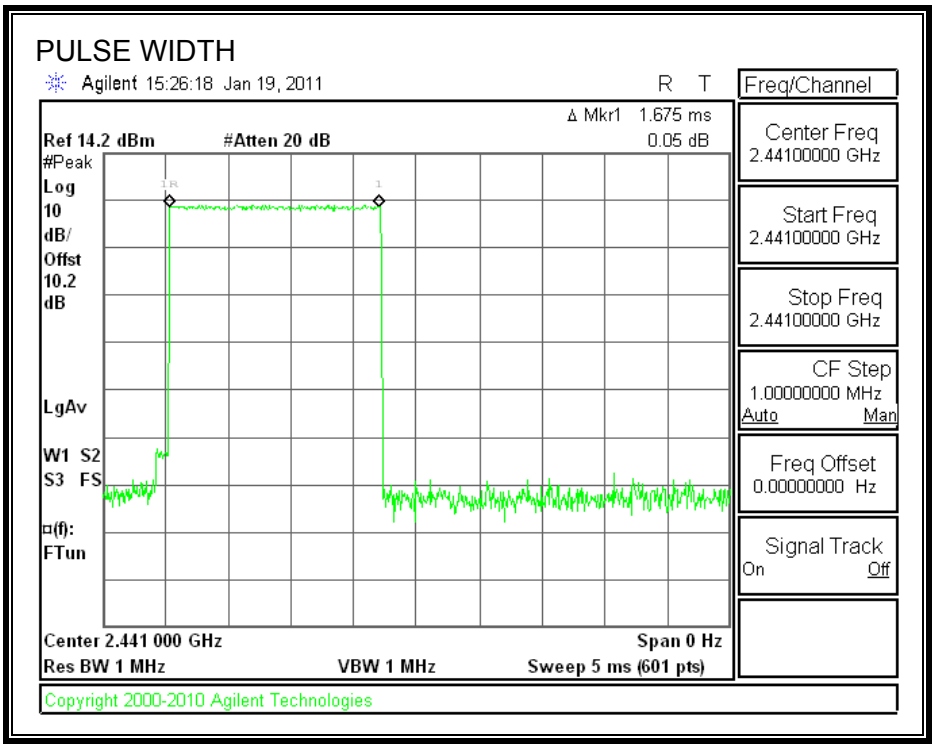
3DH1 PULSE WIDTH



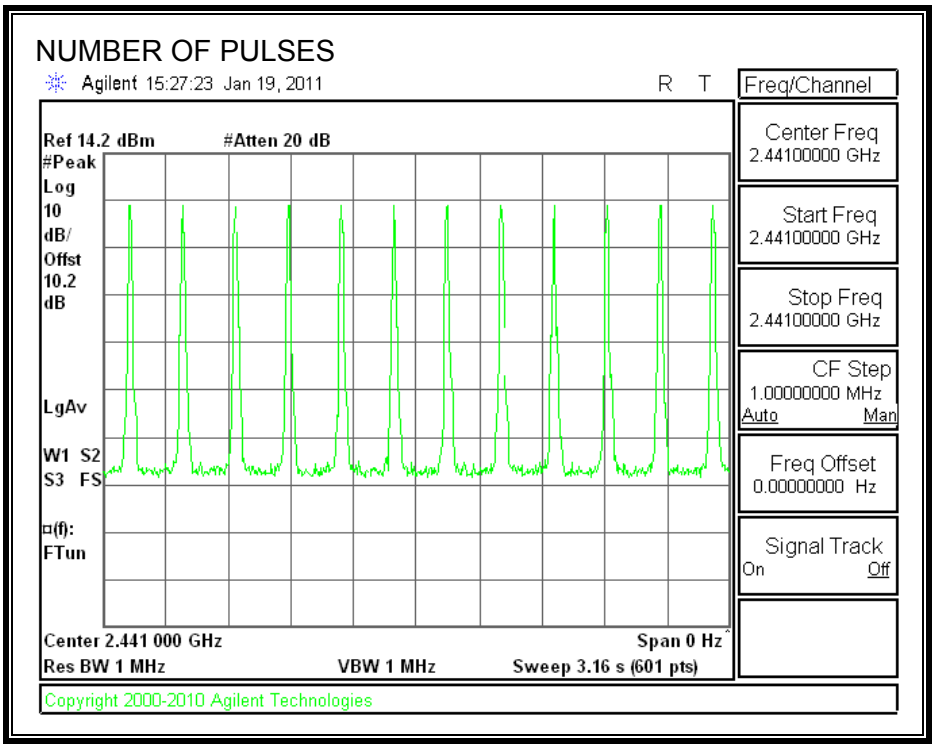
3DH1 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



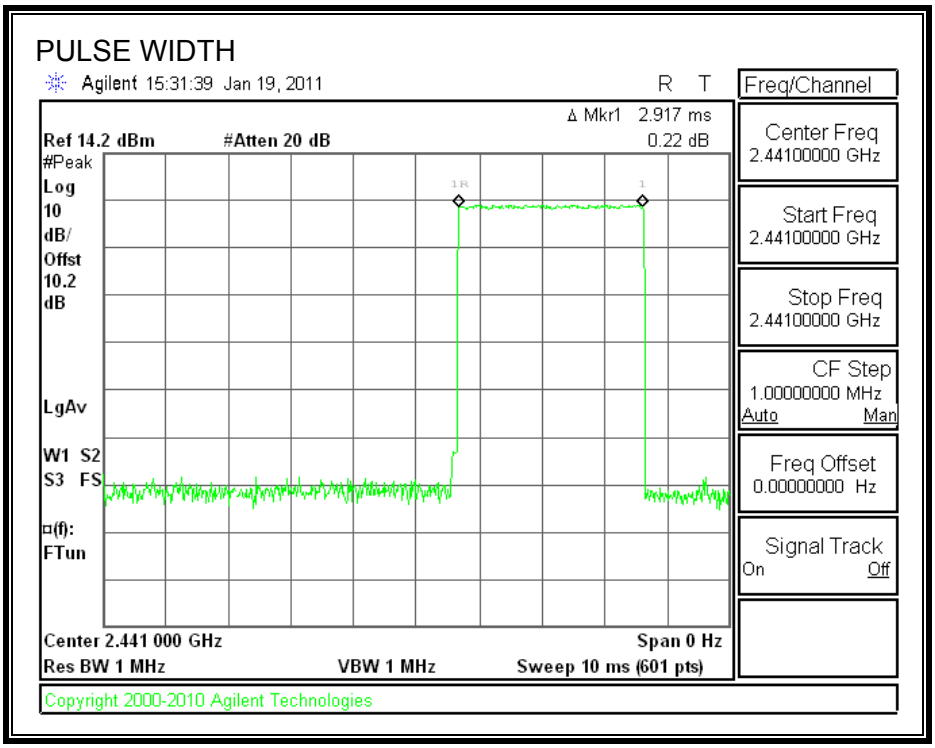
3DH3 PULSE WIDTH



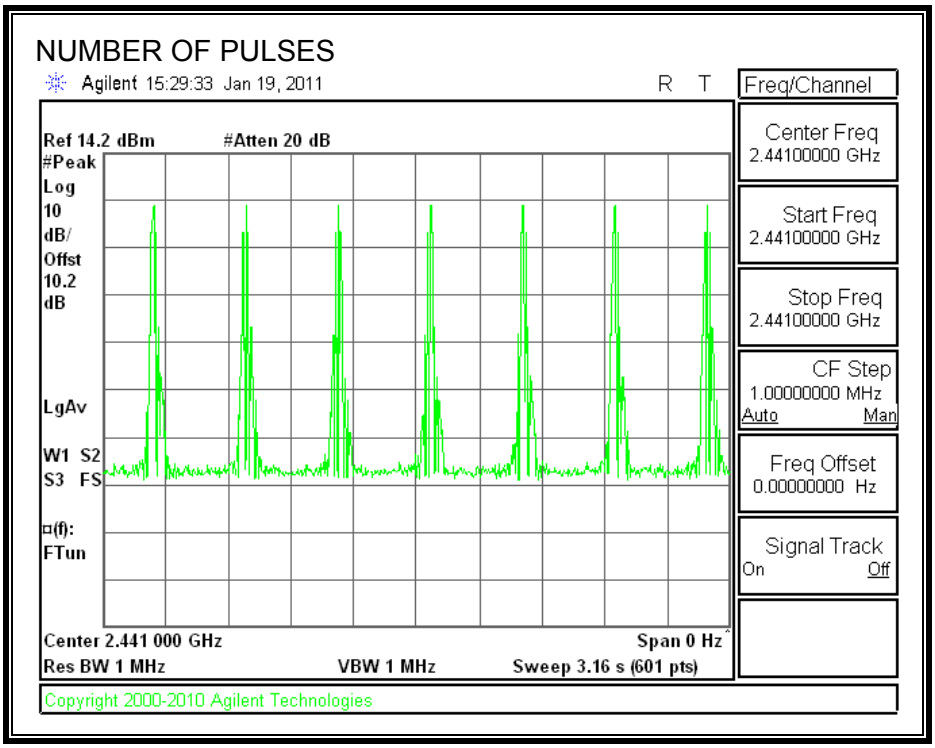
3DH3 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



3DH5 PULSE WIDTH



3DH5 NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD



7.2.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-210 Issue 7 Clause A8.4

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

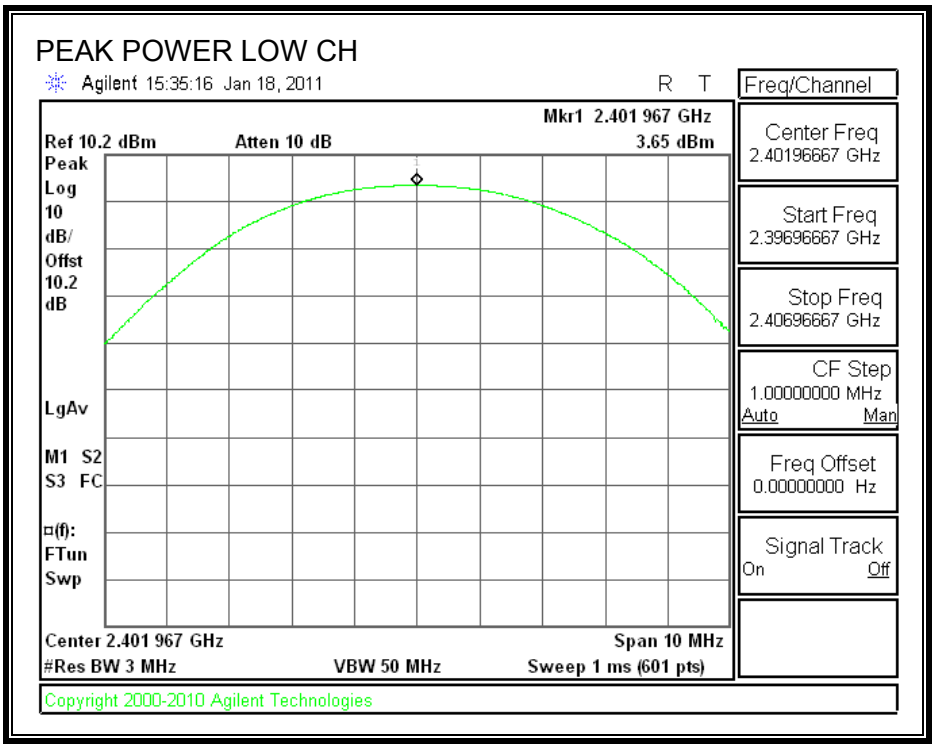
TEST PROCEDURE

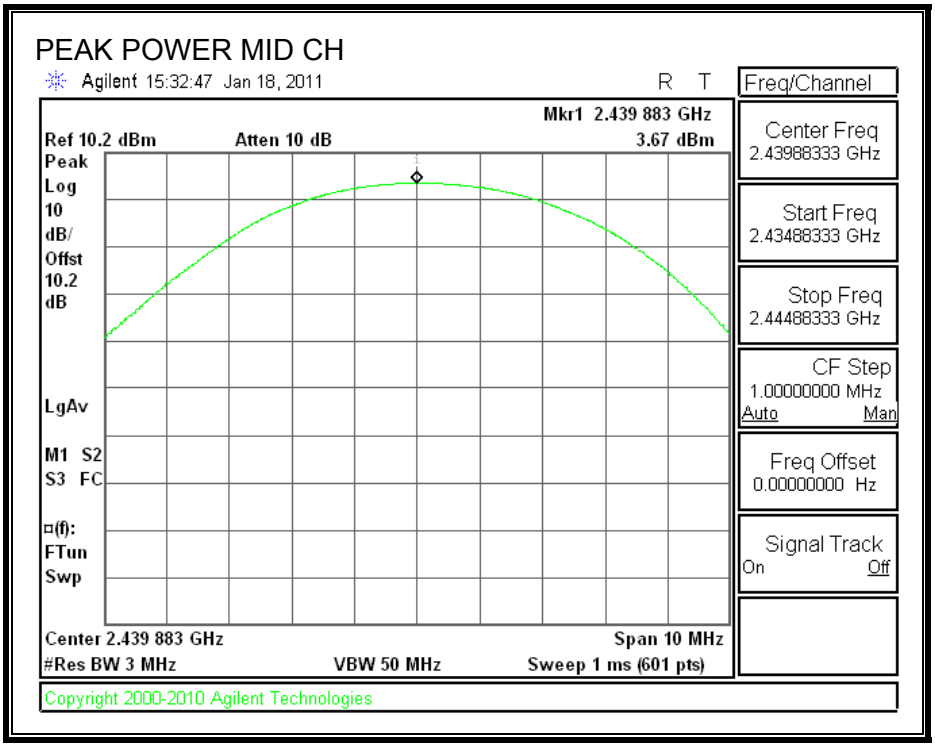
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

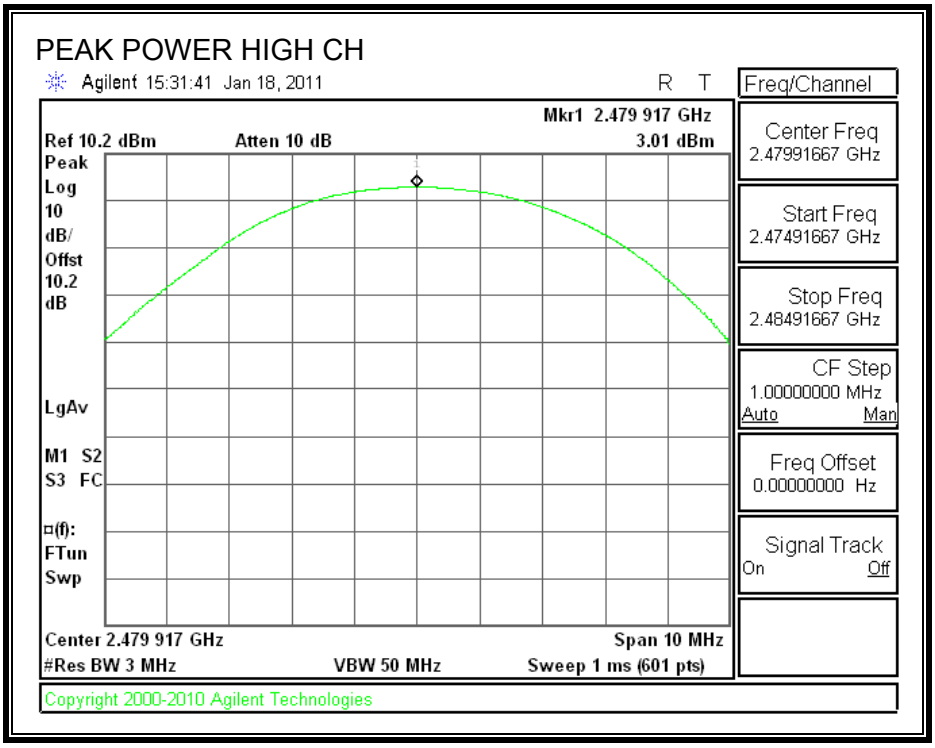
RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	3.65	30	-26.35
Middle	2441	3.67	30	-26.33
High	2480	3.01	30	-26.99

OUTPUT POWER







7.2.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 10.2 dB (including 10 dB pad and 0.2 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	-1.35
Middle	2441	-1.15
High	2480	-1.88

7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Limit = -20 dBc

TEST PROCEDURE

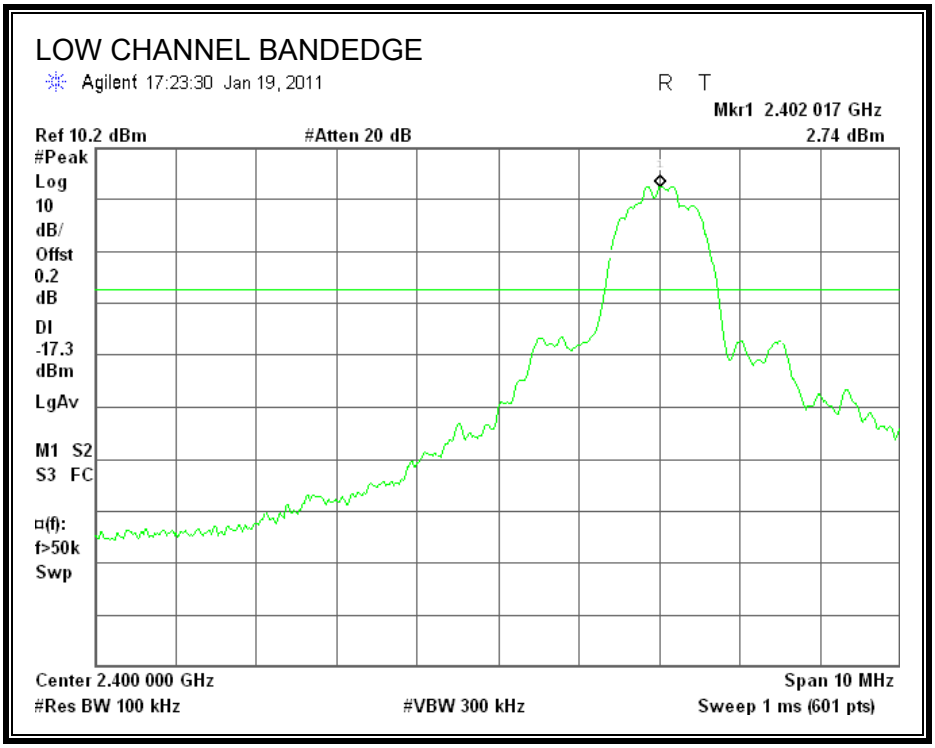
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

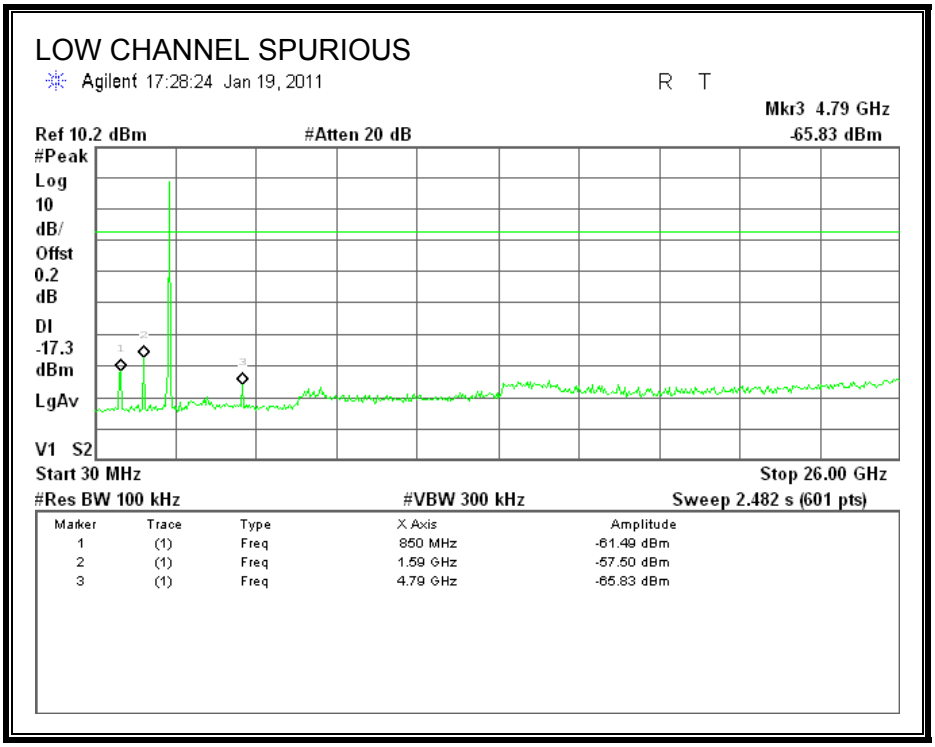
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

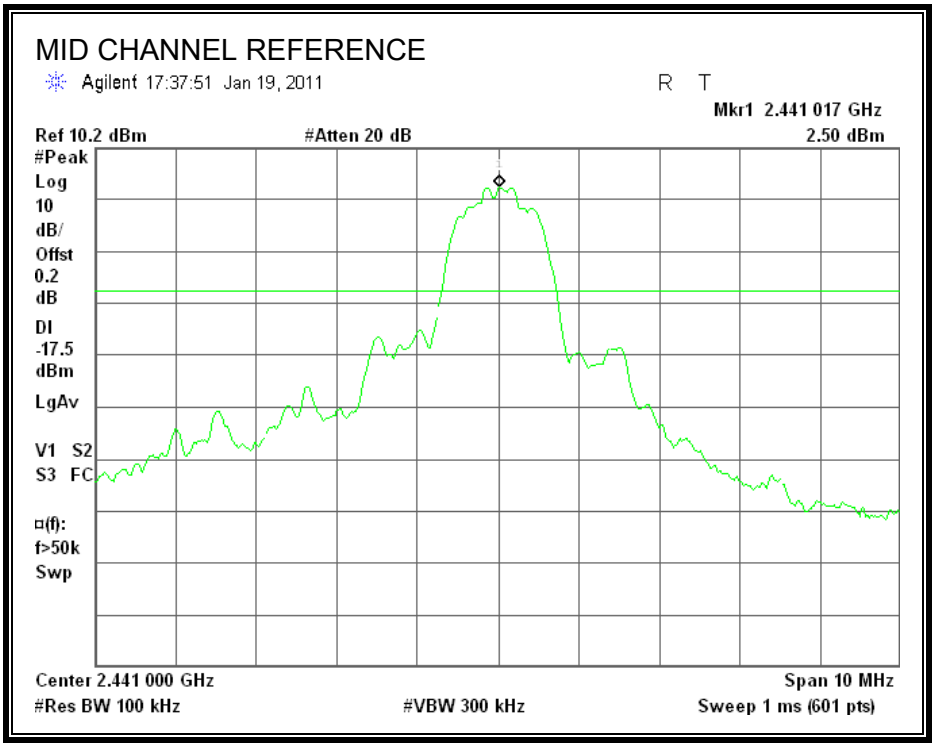
RESULTS

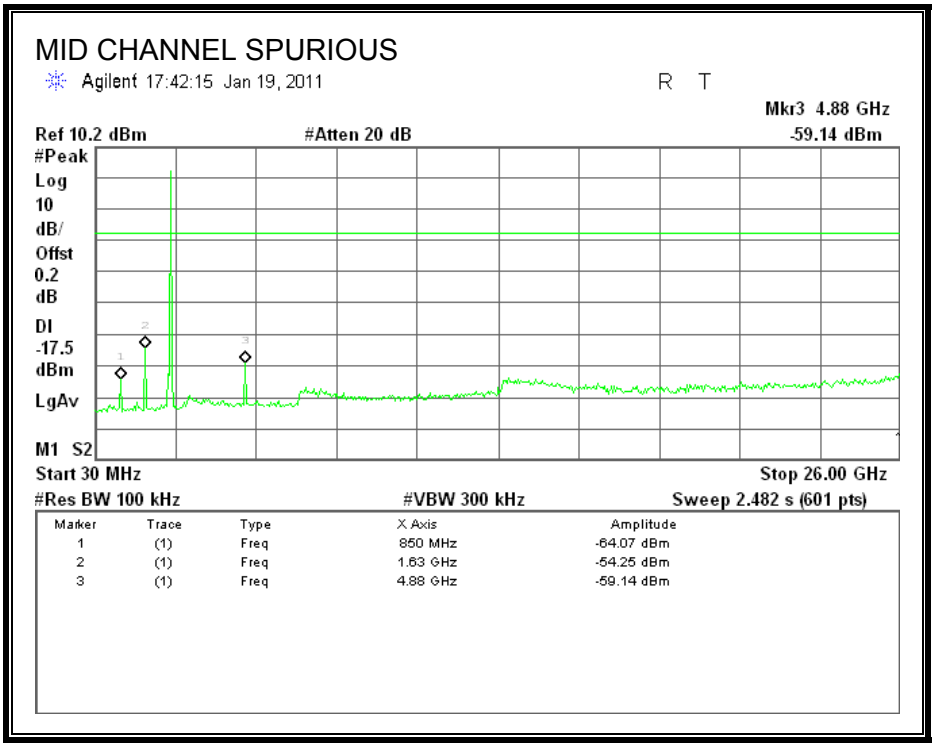
SPURIOUS EMISSIONS, LOW CHANNEL



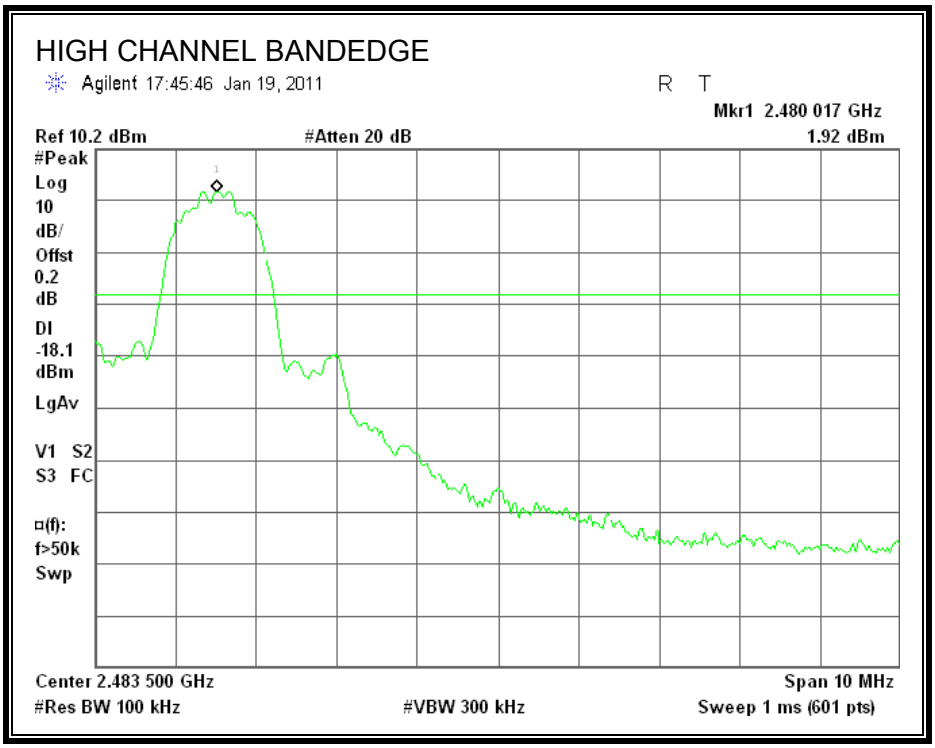


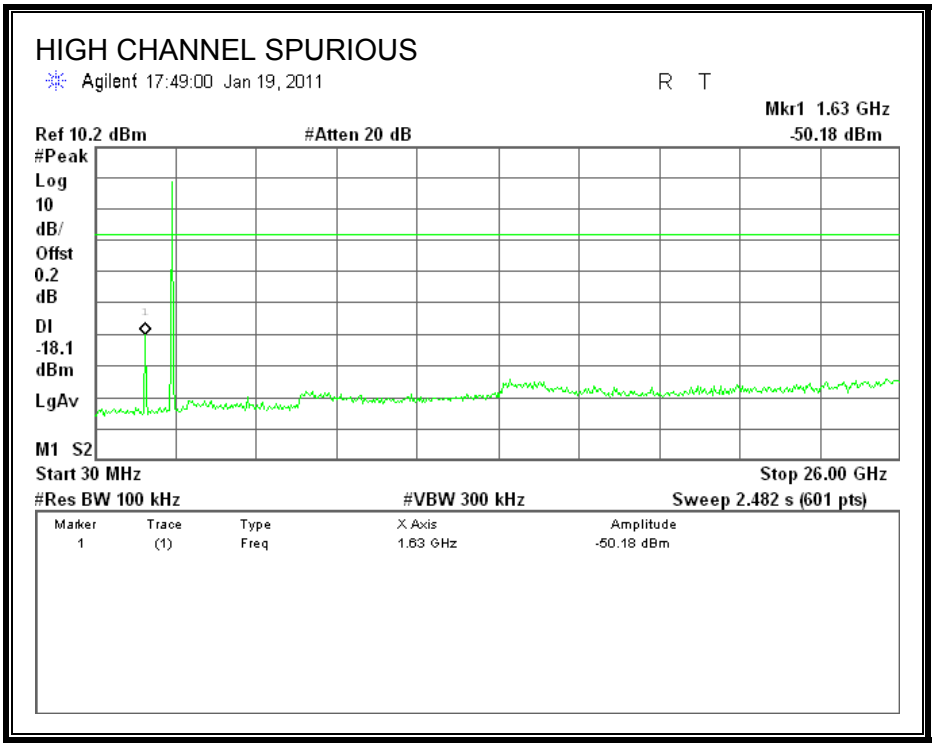
SPURIOUS EMISSIONS, MID CHANNEL



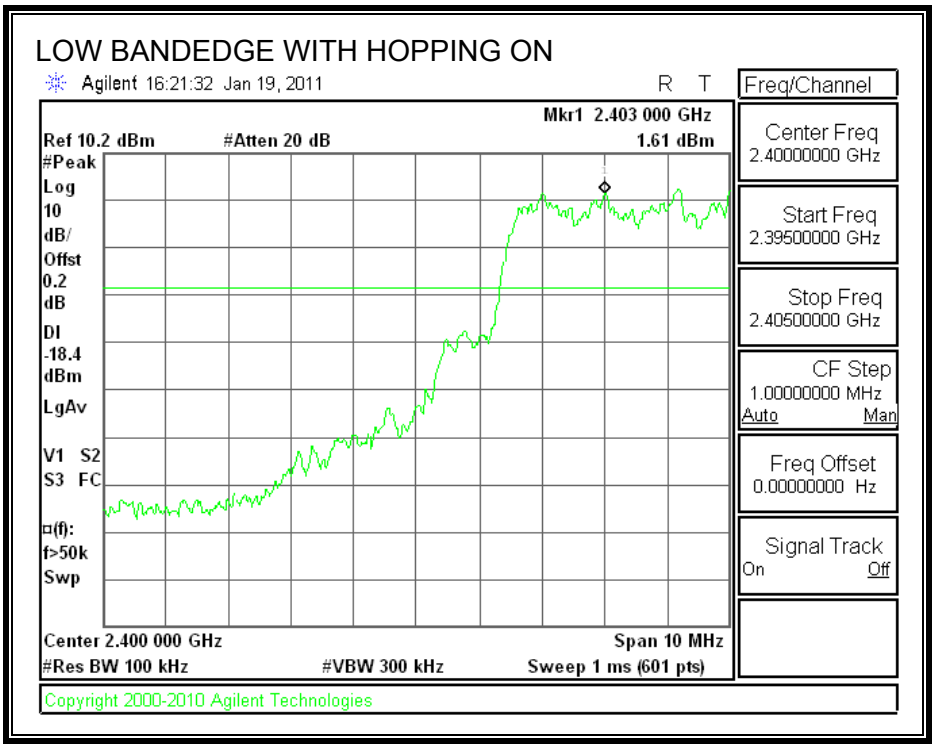


SPURIOUS EMISSIONS, HIGH CHANNEL

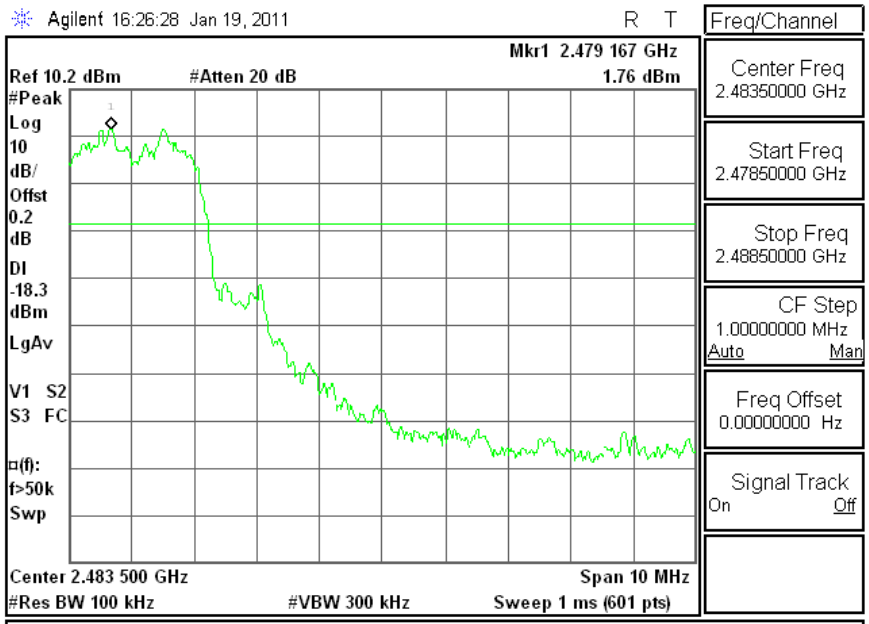




SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

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

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

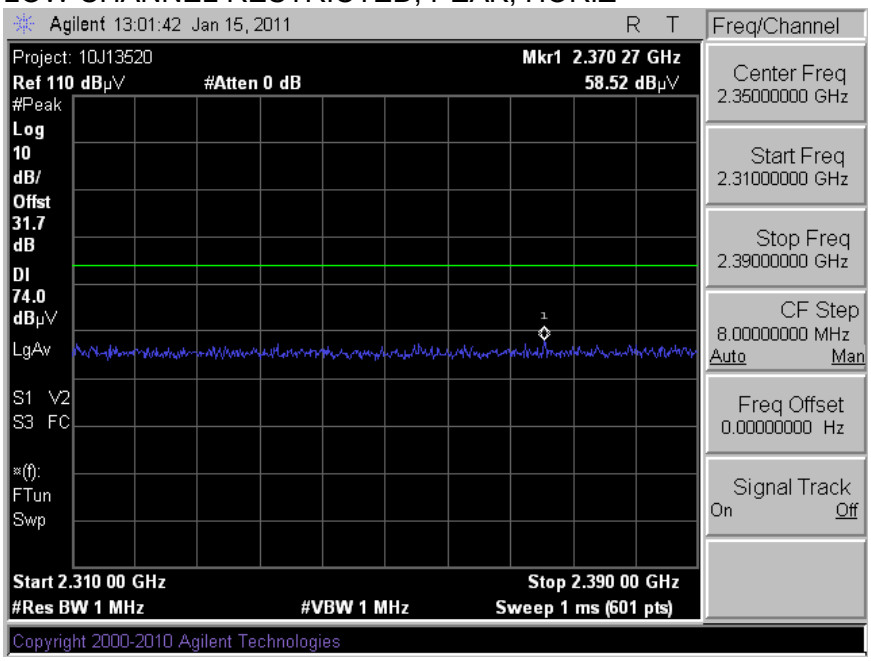
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

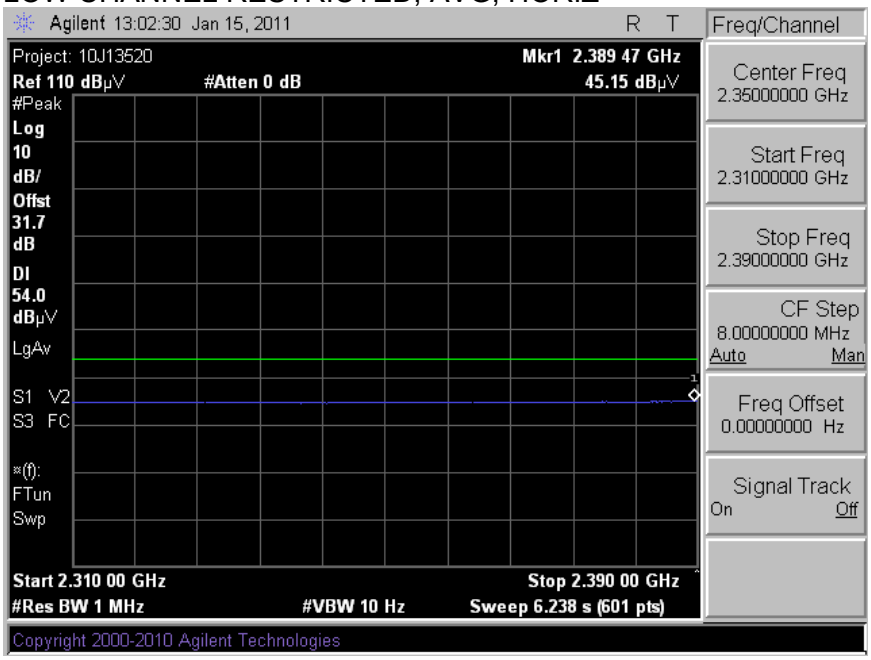
8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

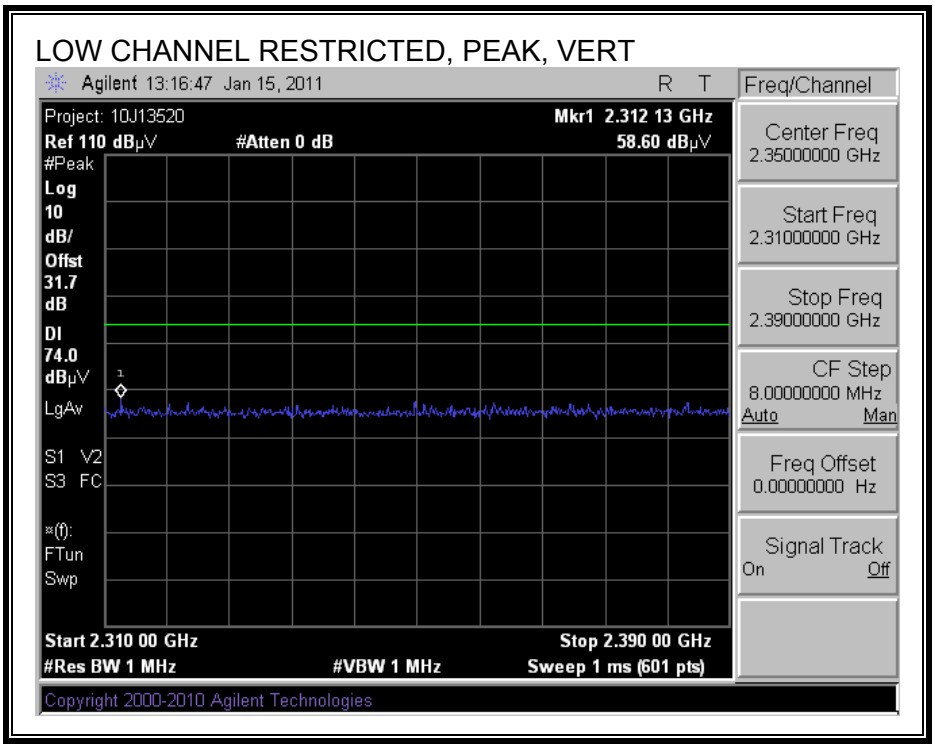
LOW CHANNEL RESTRICTED, PEAK, HORIZ



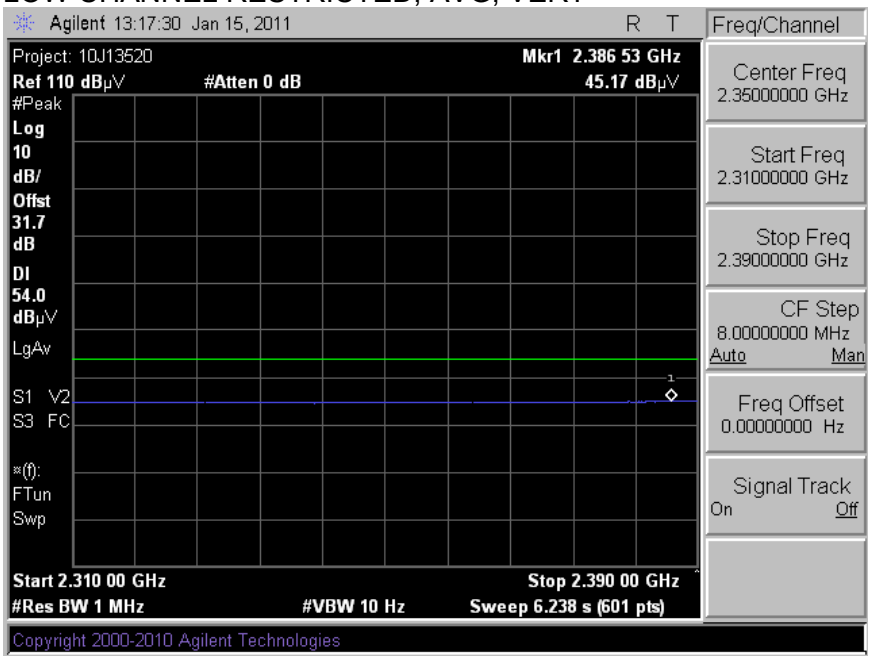
LOW CHANNEL RESTRICTED, AVG, HORIZ



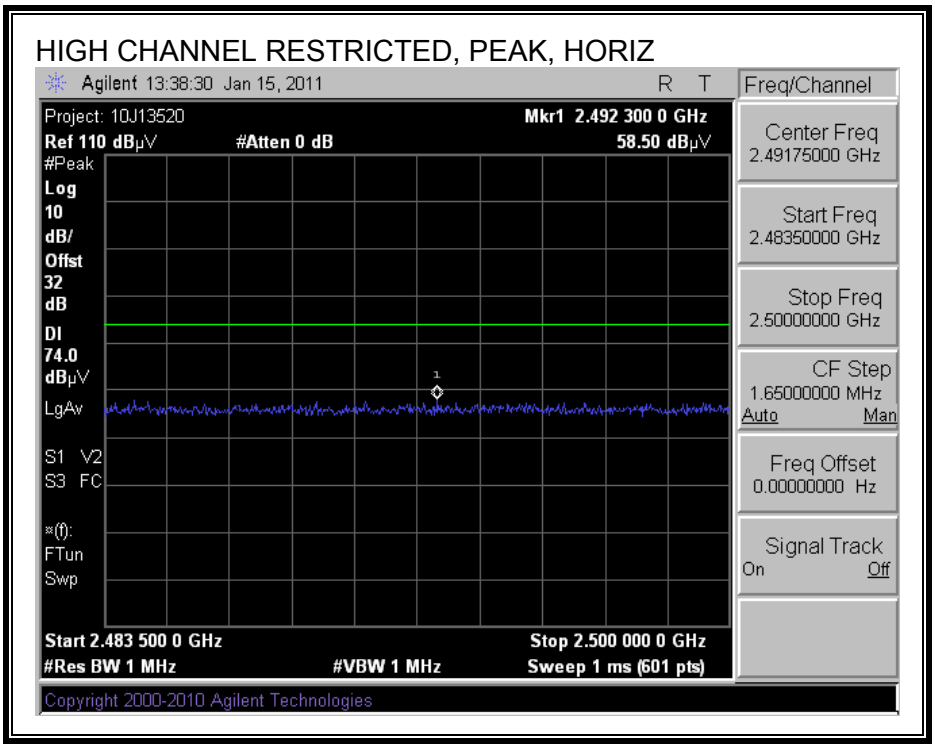
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



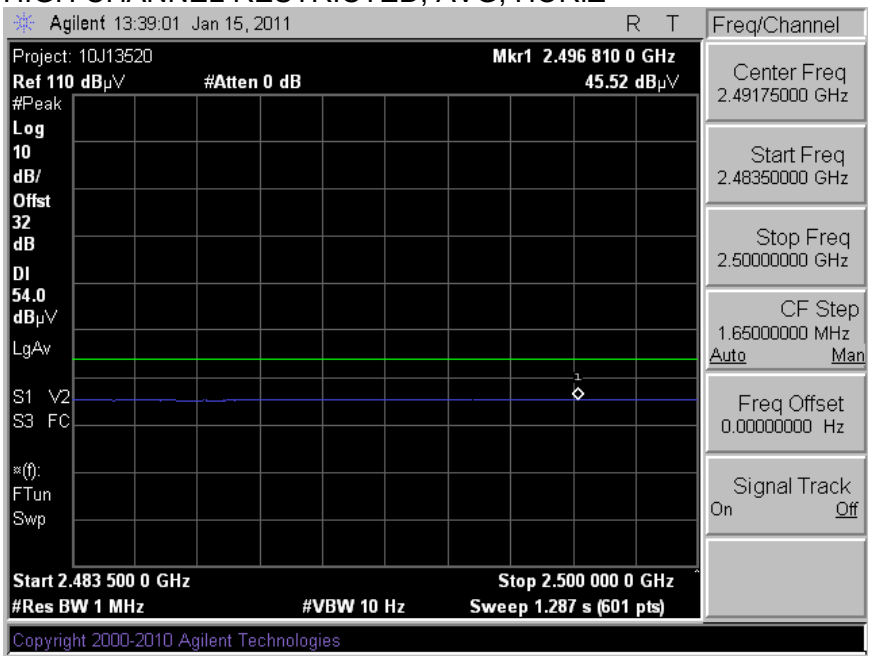
LOW CHANNEL RESTRICTED, AVG, VERT



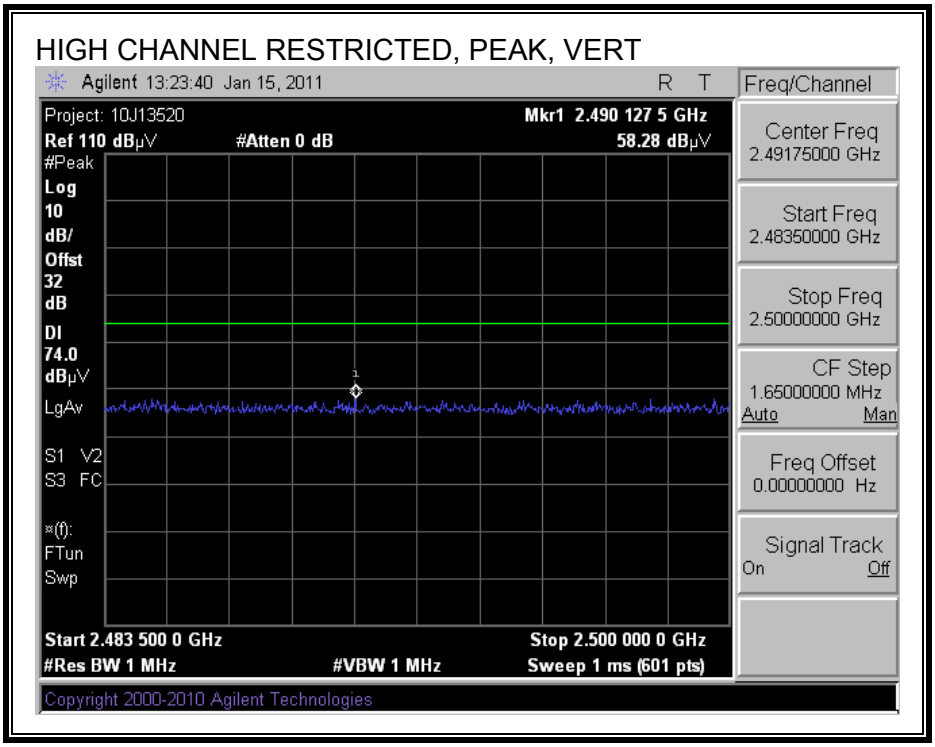
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



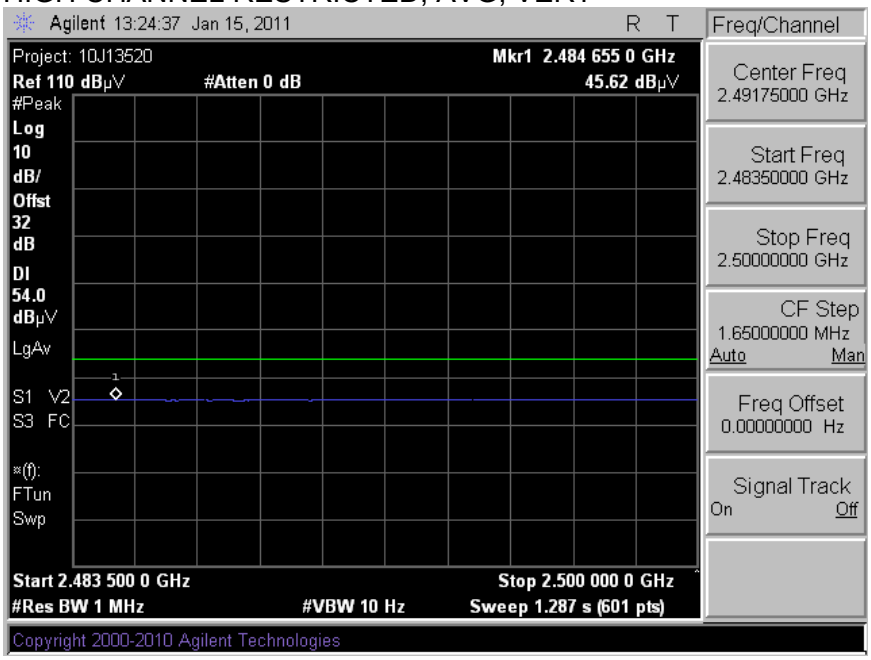
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 01/15/11
Project #: 10J13520
Company: ALPS
Test Target: FCC Class B
Mode Oper: GFSK TX mode

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

Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

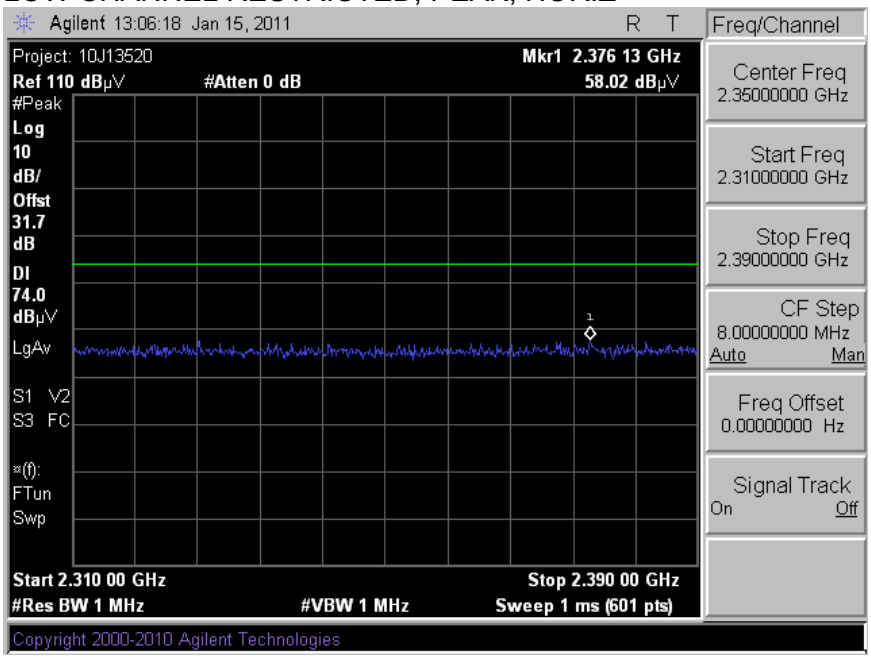
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2402MHz Low CH													
4.804	3.0	47.9	33.0	5.8	-36.5	0.0	0.0	50.2	74.0	-23.8	V	P	GFSK
4.804	3.0	36.4	33.0	5.8	-36.5	0.0	0.0	38.7	54.0	-15.3	V	A	GFSK
12.010	3.0	35.3	39.0	9.7	-35.4	0.0	0.0	48.6	74.0	-25.4	V	P	GFSK
12.010	3.0	23.3	39.0	9.7	-35.4	0.0	0.0	36.6	54.0	-17.4	V	A	GFSK
2402MHz Low CH													
4.804	3.0	46.1	33.0	5.8	-36.5	0.0	0.0	48.4	74.0	-25.6	H	P	GFSK
4.804	3.0	35.1	33.0	5.8	-36.5	0.0	0.0	37.4	54.0	-16.6	H	A	GFSK
12.010	3.0	36.9	39.0	9.7	-35.4	0.0	0.0	50.2	74.0	-23.8	H	P	GFSK
12.010	3.0	24.0	39.0	9.7	-35.4	0.0	0.0	37.3	54.0	-16.7	H	A	GFSK
2441 MHz Mid CH													
4.882	3.0	41.5	32.8	5.8	-36.5	0.0	0.0	43.7	74.0	-30.3	H	P	GFSK
4.882	3.0	31.4	32.8	5.8	-36.5	0.0	0.0	33.5	54.0	-20.5	H	A	GFSK
4.882	3.0	44.2	32.8	5.8	-36.5	0.0	0.0	46.4	74.0	-27.6	V	P	GFSK
4.882	3.0	33.2	32.8	5.8	-36.5	0.0	0.0	35.4	54.0	-18.6	V	A	GFSK
2480MHz High CH													
4.960	3.0	38.2	33.2	5.9	-36.5	0.0	0.0	40.8	74.0	-33.2	H	P	GFSK
4.960	3.0	26.0	33.2	5.9	-36.5	0.0	0.0	28.6	54.0	-25.4	H	A	GFSK
7.440	3.0	40.3	35.5	7.3	-36.2	0.0	0.0	46.9	74.0	-27.1	H	P	GFSK
7.440	3.0	28.8	35.5	7.3	-36.2	0.0	0.0	35.4	54.0	-18.6	H	A	GFSK
12.400	3.0	35.9	39.0	9.9	-35.4	0.0	0.0	49.4	74.0	-24.6	H	P	GFSK
12.400	3.0	23.7	39.0	9.9	-35.4	0.0	0.0	37.2	54.0	-16.8	H	A	GFSK
2480MHz High CH													
4.960	3.0	39.1	33.2	5.9	-36.5	0.0	0.0	41.7	74.0	-32.3	V	P	GFSK
4.960	3.0	28.3	33.2	5.9	-36.5	0.0	0.0	30.9	54.0	-23.1	V	A	GFSK
7.440	3.0	41.9	35.5	7.3	-36.2	0.0	0.0	48.5	74.0	-25.5	V	P	GFSK
7.440	3.0	30.8	35.5	7.3	-36.2	0.0	0.0	37.4	54.0	-16.6	V	A	GFSK
12.400	3.0	35.8	39.0	9.9	-35.4	0.0	0.0	49.3	74.0	-24.7	V	P	GFSK
12.400	3.0	23.6	39.0	9.9	-35.4	0.0	0.0	37.2	54.0	-16.8	V	A	GFSK

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

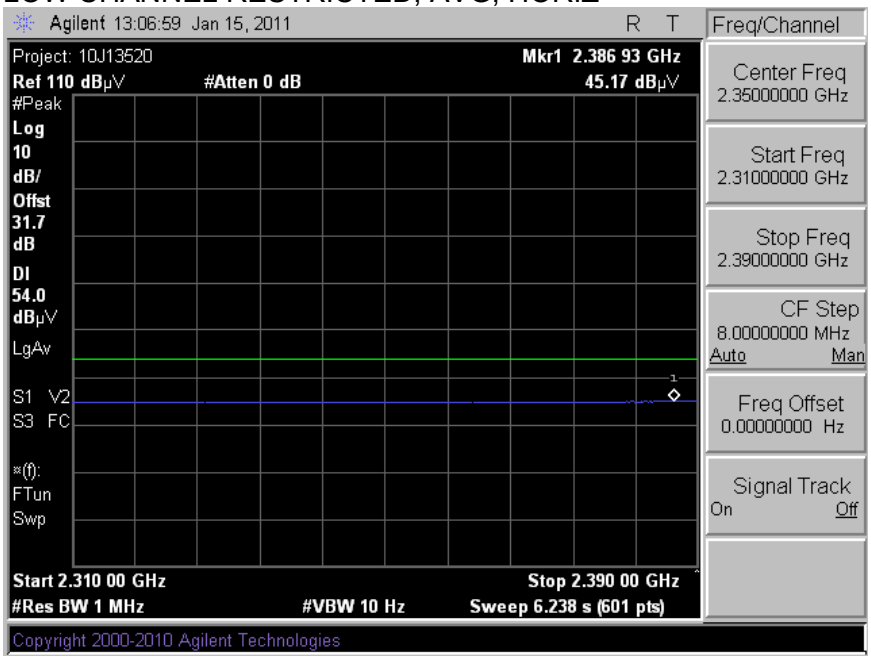
8.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

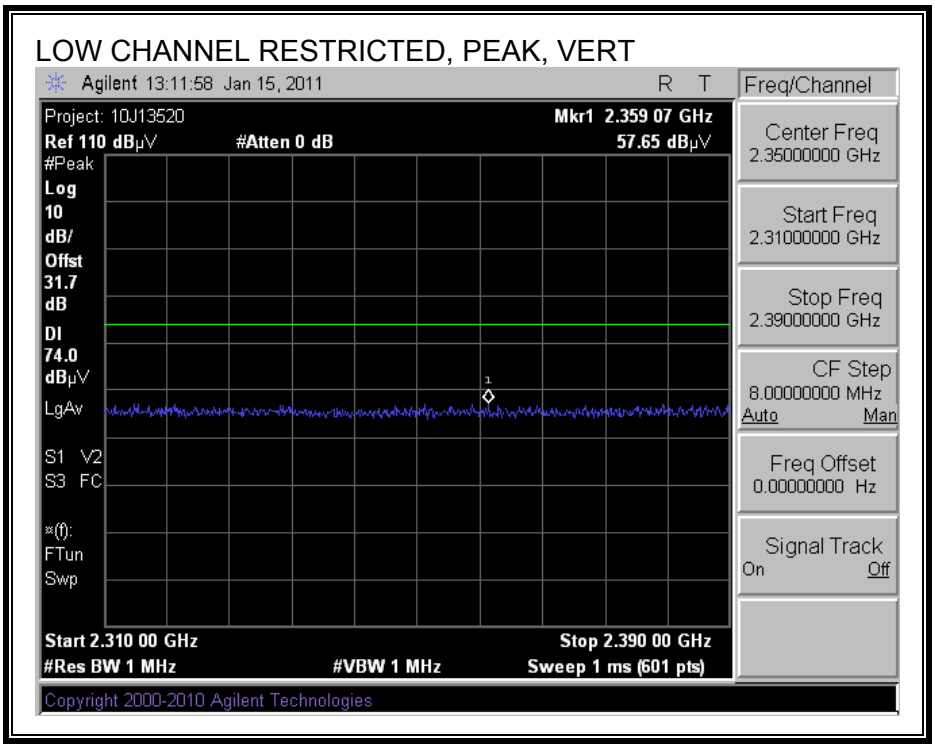
LOW CHANNEL RESTRICTED, PEAK, HORIZ



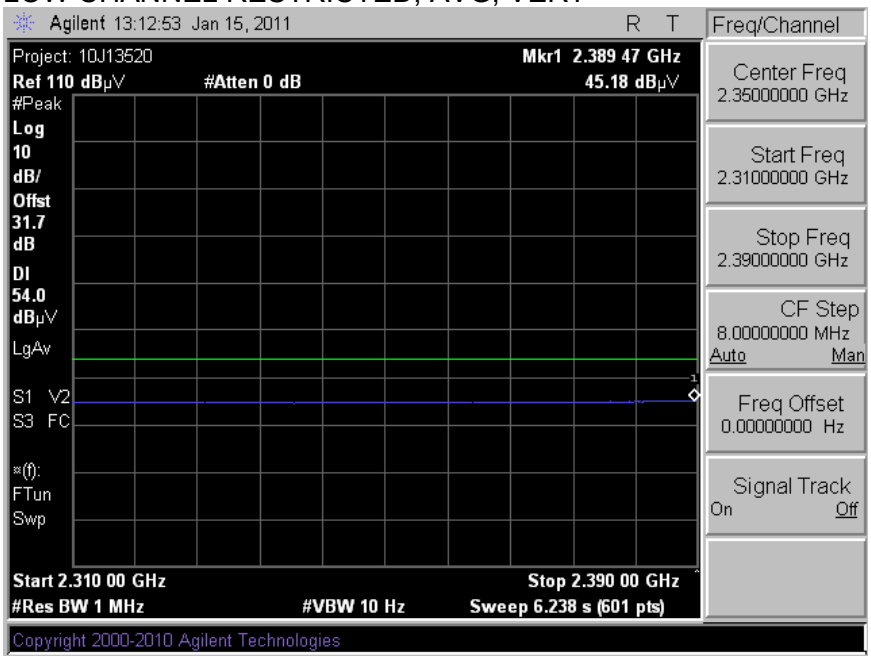
LOW CHANNEL RESTRICTED, AVG, HORIZ



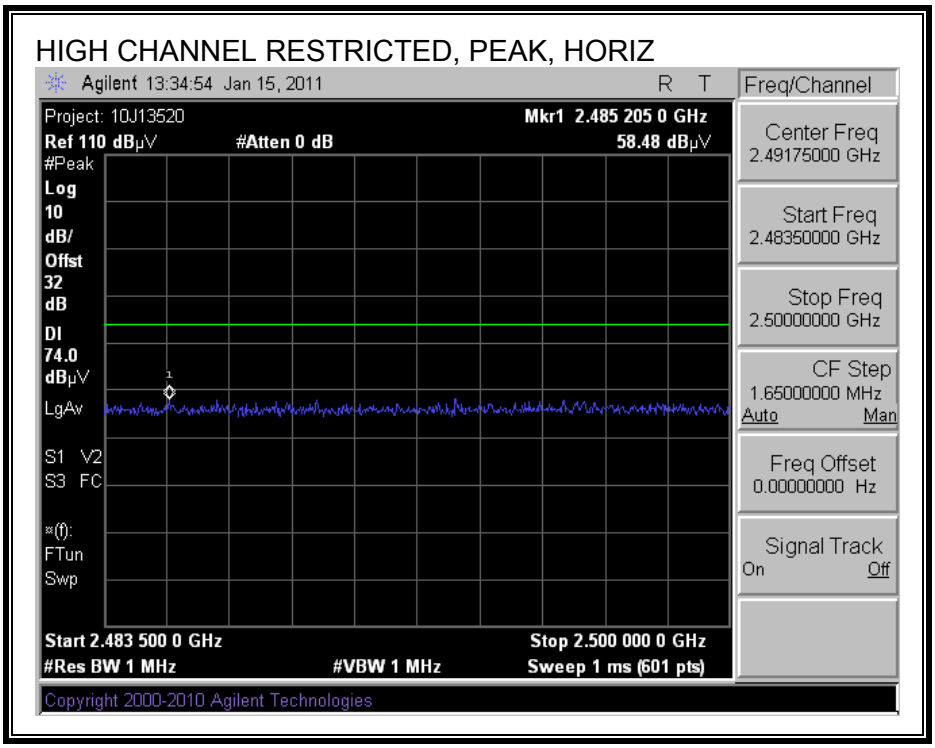
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



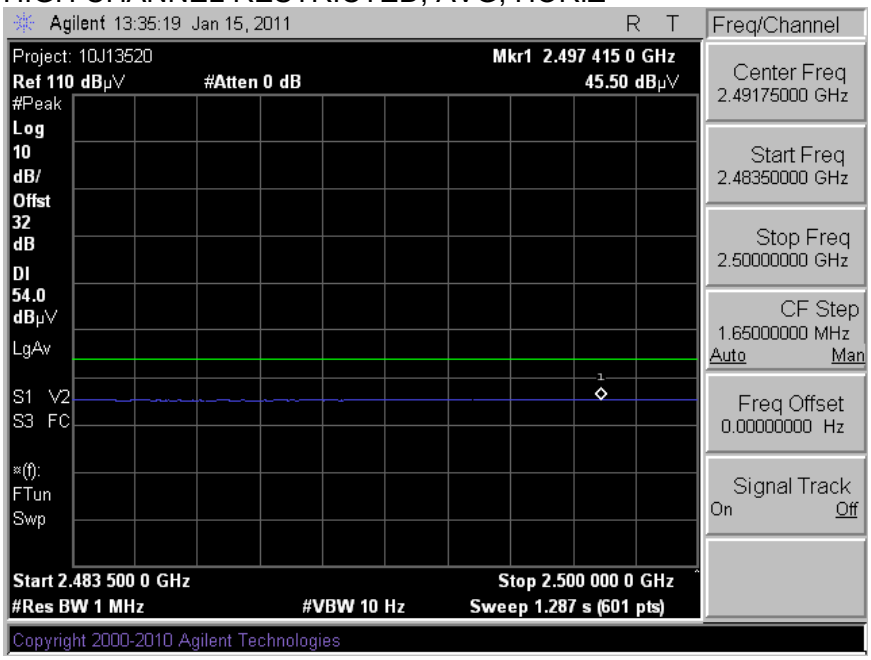
LOW CHANNEL RESTRICTED, AVG, VERT



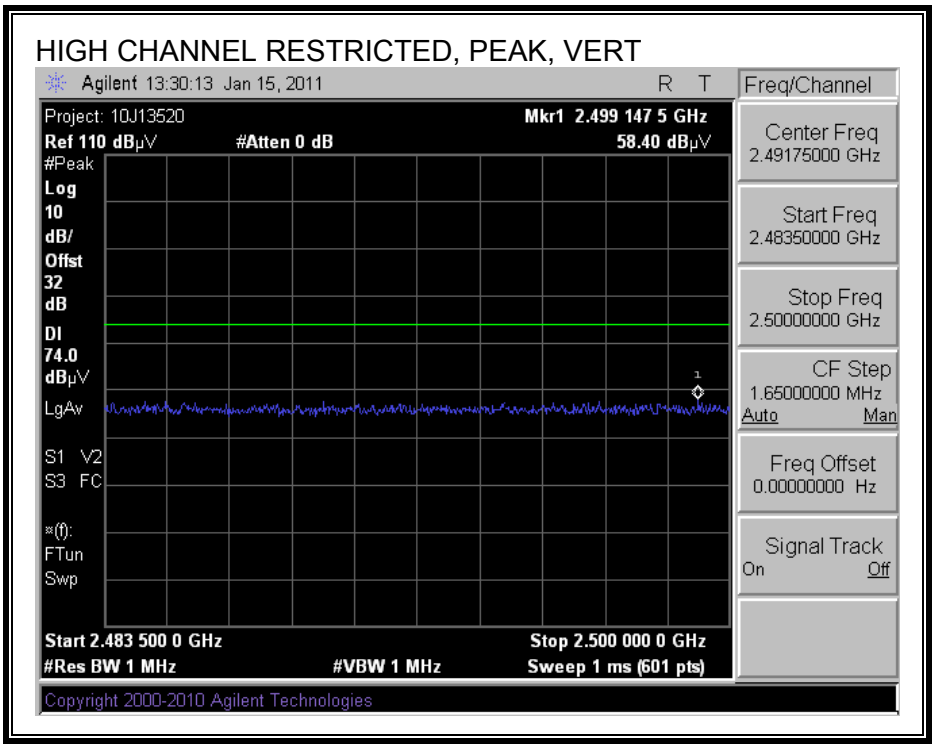
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



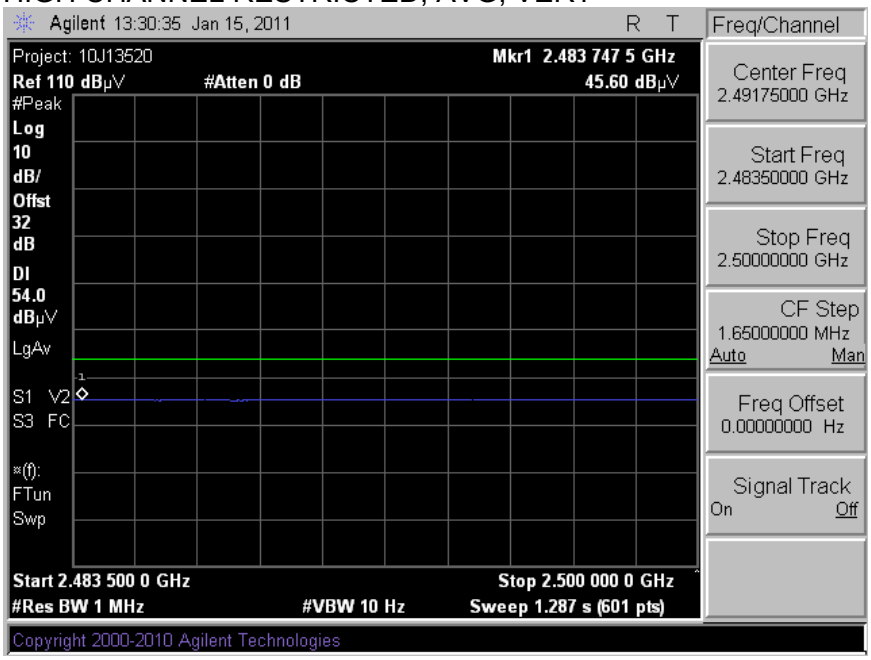
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 01/15/11
Project #: 10J13520
Company: ALPS
Test Target: FCC Class B
Mode Oper: 8PSK TX mode

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

Average Field Strength Limit
Peak Field Strength Limit
Margin vs. Average Limit
Margin vs. Peak Limit

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
2402 MHz Low CH													
4.804	3.0	42.6	32.8	5.8	-36.5	0.0	0.0	44.7	74.0	-29.3	H	P	8PSK
4.804	3.0	31.2	32.8	5.8	-36.5	0.0	0.0	33.3	54.0	-20.7	H	A	8PSK
12.010	3.0	35.1	38.5	9.7	-35.4	0.0	0.0	47.9	74.0	-26.1	H	P	8PSK
12.010	3.0	23.1	38.5	9.7	-35.4	0.0	0.0	35.9	54.0	-18.1	H	A	8PSK
2402 MHz Low CH													
4.804	3.0	44.7	32.8	5.8	-36.5	0.0	0.0	46.7	74.0	-27.3	V	P	8PSK
4.804	3.0	32.3	32.8	5.8	-36.5	0.0	0.0	34.3	54.0	-19.7	V	A	8PSK
7.206	3.0	38.1	35.0	7.2	-36.2	0.0	0.0	44.1	74.0	-29.9	V	P	8PSK
7.206	3.0	25.0	35.0	7.2	-36.2	0.0	0.0	31.1	54.0	-22.9	V	A	8PSK
12.010	3.0	35.1	38.5	9.7	-35.4	0.0	0.0	47.9	74.0	-26.1	V	P	8PSK
12.010	3.0	23.1	38.5	9.7	-35.4	0.0	0.0	35.9	54.0	-18.1	V	A	8PSK
2441 MHz Mid CH													
4.882	3.0	41.2	32.8	5.8	-36.5	0.0	0.0	43.4	74.0	-30.6	V	P	8PSK
4.882	3.0	29.2	32.8	5.8	-36.5	0.0	0.0	31.4	54.0	-22.6	V	A	8PSK
4.882	3.0	39.6	32.8	5.8	-36.5	0.0	0.0	41.8	74.0	-32.2	H	P	8PSK
4.882	3.0	28.0	32.8	5.8	-36.5	0.0	0.0	30.2	54.0	-23.8	H	A	8PSK
2480 MHz High CH													
4.960	3.0	39.5	32.9	5.9	-36.5	0.0	0.0	41.8	74.0	-32.2	V	P	8PSK
4.960	3.0	25.7	32.9	5.9	-36.5	0.0	0.0	28.0	54.0	-26.0	V	A	8PSK
7.440	3.0	38.7	35.4	7.3	-36.2	0.0	0.0	45.2	74.0	-28.8	V	P	8PSK
7.440	3.0	26.6	35.4	7.3	-36.2	0.0	0.0	33.1	54.0	-20.9	V	A	8PSK
12.400	3.0	35.3	38.7	9.9	-35.4	0.0	0.0	48.6	74.0	-25.4	V	P	8PSK
12.400	3.0	23.4	38.7	9.9	-35.4	0.0	0.0	36.6	54.0	-17.4	V	A	8PSK
2480 MHz High CH													
4.960	3.0	38.2	32.9	5.9	-36.5	0.0	0.0	40.5	74.0	-33.5	H	P	8PSK
4.960	3.0	25.7	32.9	5.9	-36.5	0.0	0.0	28.0	54.0	-26.0	H	A	8PSK
7.440	3.0	37.7	35.4	7.3	-36.2	0.0	0.0	44.2	74.0	-29.8	H	P	8PSK
7.440	3.0	25.5	35.4	7.3	-36.2	0.0	0.0	32.0	54.0	-22.0	H	A	8PSK
12.400	3.0	36.0	38.7	9.9	-35.4	0.0	0.0	49.2	74.0	-24.8	H	P	8PSK
12.400	3.0	23.4	38.7	9.9	-35.4	0.0	0.0	36.6	54.0	-17.4	H	A	8PSK

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.3. RECEIVER ABOVE 1 GHz

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: ALPS
Project #: 10J13520
Date: 2011/1/15
Test Engineer: Tom Chen
Configuration: EUT with support Laptop PC and DC power supply
Mode: RX mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 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
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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)
1.193	3.0	54.5	39.7	24.5	2.6	-39.2	0.0	0.0	42.3	27.6	74	54	-31.7	-26.4	V
1.540	3.0	54.9	40.2	25.7	3.0	-38.7	0.0	0.0	44.9	30.1	74	54	-29.1	-23.9	V
1.653	3.0	54.1	39.3	26.0	3.1	-38.6	0.0	0.0	44.6	29.9	74	54	-29.4	-24.1	V
1.540	3.0	58.9	42.7	25.7	3.0	-38.7	0.0	0.0	48.8	32.6	74	54	-25.2	-21.4	H
1.653	3.0	53.7	37.5	26.0	3.1	-38.6	0.0	0.0	44.3	28.1	74	54	-29.7	-25.9	H

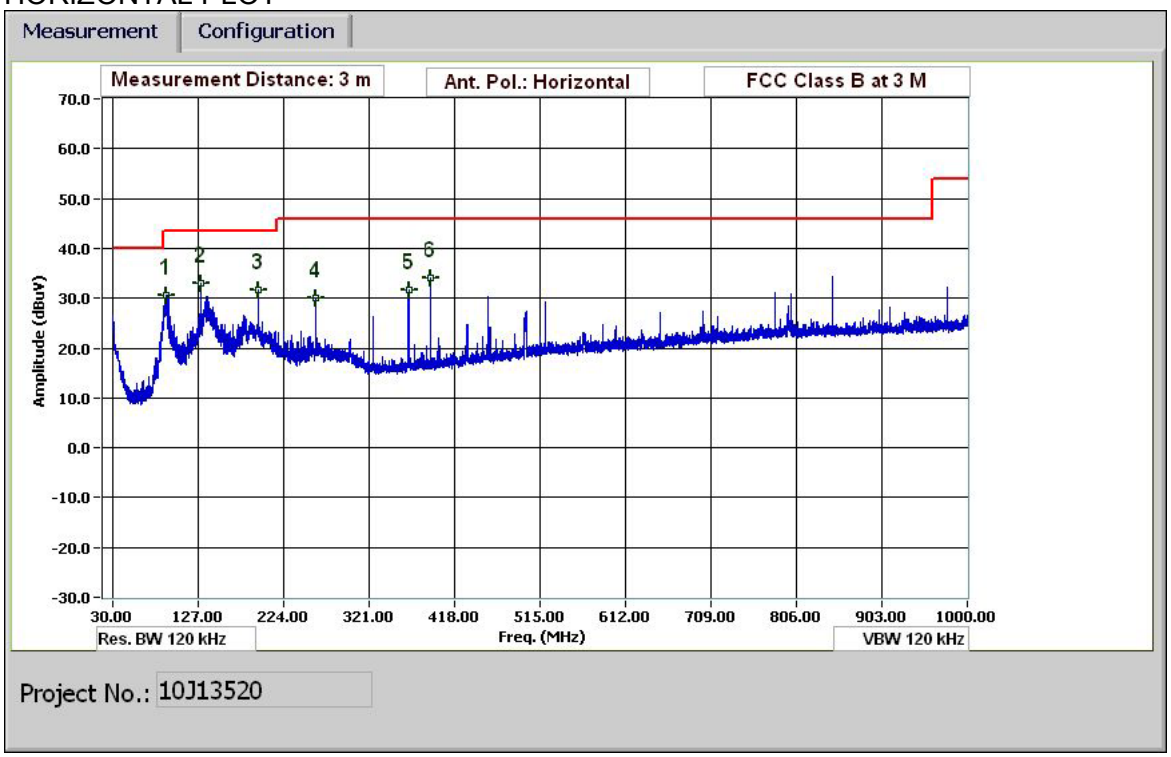
Rev. 07.22.09

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

8.4. WORST-CASE BELOW 1 GHz

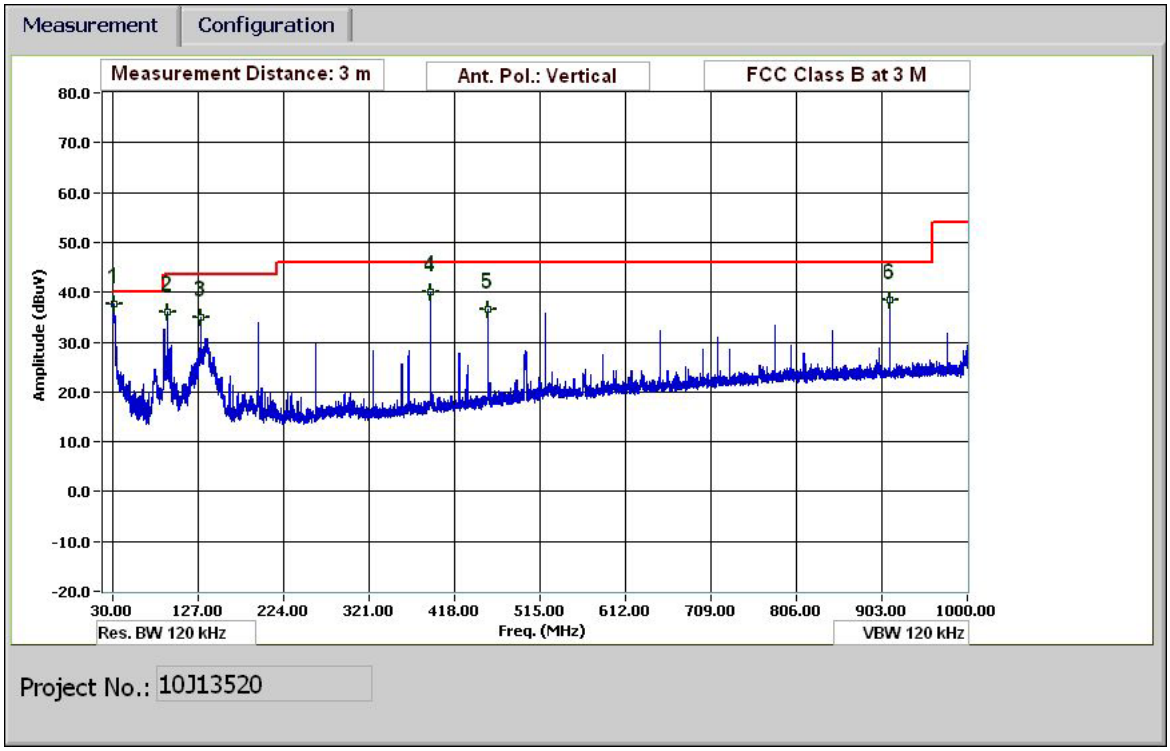
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 01/15/11
Project #: 10J13520
Company: ALPS
Test Target: FCC Class B
Mode Oper: TX mode Worst case

f	Measurement Frequency	Amp	Preamp Gain
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

Margin — Margin vs. Limit

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Vertical													
30.84	3.0	41.5	19.7	0.5	28.4	0.0	0.0	33.3	40.0	-6.7	V	QP	
92.403	3.0	55.3	8.1	0.9	28.3	0.0	0.0	35.9	43.5	-7.6	V	P	
130.324	3.0	48.6	13.5	1.1	28.3	0.0	0.0	34.9	43.5	-8.6	V	P	
390.855	3.0	51.5	14.8	1.8	28.1	0.0	0.0	40.0	46.0	-6.0	V	P	
456.018	3.0	46.5	15.9	1.9	27.9	0.0	0.0	36.5	46.0	-9.5	V	P	
912.036	3.0	41.4	21.9	2.8	27.8	0.0	0.0	38.4	46.0	-7.6	V	P	
Horizontal													
90.963	3.0	50.3	7.8	0.8	28.3	0.0	0.0	30.6	43.5	-12.9	H	P	
130.324	3.0	46.7	13.5	1.1	28.3	0.0	0.0	33.0	43.5	-10.5	H	P	
195.367	3.0	46.9	11.7	1.2	28.2	0.0	0.0	31.6	43.5	-11.9	H	P	
260.53	3.0	44.8	12.1	1.4	28.2	0.0	0.0	30.1	46.0	-15.9	H	P	
366.494	3.0	43.8	14.4	1.7	28.1	0.0	0.0	31.8	46.0	-14.2	H	P	
390.855	3.0	45.6	14.8	1.8	28.1	0.0	0.0	34.1	46.0	-11.9	H	P	

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

9. AC POWER LINE CONDUCTED EMISSIONS

EUT is only powered by batteries and it does not connect to the public power network; therefore, this test is not required.

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/m^2 is equivalent to 1 mW/cm^2.
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 = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m
EIRP = Equivalent Isotropic Radiated Power in W
S = Power density in W/m^2

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

LIMITS

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

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

RESULTS

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	4.15	-0.90	0.0042	0.0004