FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-247 ISSUE 1

CERTIFICATION TEST REPORT

FOR

WIRELESS HEADSET

MODEL NUMBER: 416317

FCC ID: A94416317
IC: 3232A-416317

REPORT NUMBER: 15R20711-E2 Revision A

ISSUE DATE: JUNE 18, 2015

Prepared for
BOSE CORPORATION
THE MOUNTAIN
FRAMINGHAM, MA 01701 USA

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	6/12/15	Initial Issue	P. Zhang
A	6/18/15	Updated section 5.2 and antenna gain number	F. de Anda

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: BOSE CORPORATION
THE MOUNTAIN
FRAMINGHAM, MA 01701 U.S.A

EUT DESCRIPTION: WIRELESS HEADSET

MODEL: 416317

SERIAL NUMBER: 053818C51110032AE (RADIATED) & 070574C50850153AE (CONDUCTED)

DATE TESTED: May 18, 2015 – MAY 27, 2015

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-247 Issue 1	Pass
INDUSTRY CANADA RSS-GEN Issue 4	Pass

UL Verification Services Inc. 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 Verification Services Inc. 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 Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. 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 Verification Services Inc. By:

PENG ZHANG
PROJECT LEAD
UL Verification Services Inc.

Tested By:

CHARLES VERGONIO
EMC ENGINEER
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009 for FCC and ANSI C63.10-2013 for IC, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-247 Issue 1.

Testing for radiated emissions above 1GHz was performed with the EUT elevated at 1.5m instead of 0.8m. 1.5m is the required height in ANSI C63.10:2013 as referenced by RSS GEN issue 4. This test height has been permitted by FCC as discussed in FCC/TCB conference call in December 2014.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
☒ Chamber A	☐ Chamber D
☐ Chamber B	☐ Chamber E
☐ Chamber C	☐ Chamber F
	☐ Chamber G
	☐ Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/2000650.htm.

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
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a wireless headset.

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	BDR- GFSK	4.240	2.65

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2402 - 2480	BDR- GFSK	1.900	1.55

Note: average figures are used for RF exposure exemption calculations.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an IFA antenna, with a maximum gain of 0.75 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Version 0.1.1

The test utility software used during testing was BlueTest3.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emission was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Power line conducted emissions were not performed since EUT powered by battery.

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

Worst-case data rates were:
GFSK mode: DH5

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Lenovo	T440	PC-00TFVU	N/A
AC Adapter	Lenovo	ADLX65NDC2A	36200282	N/A

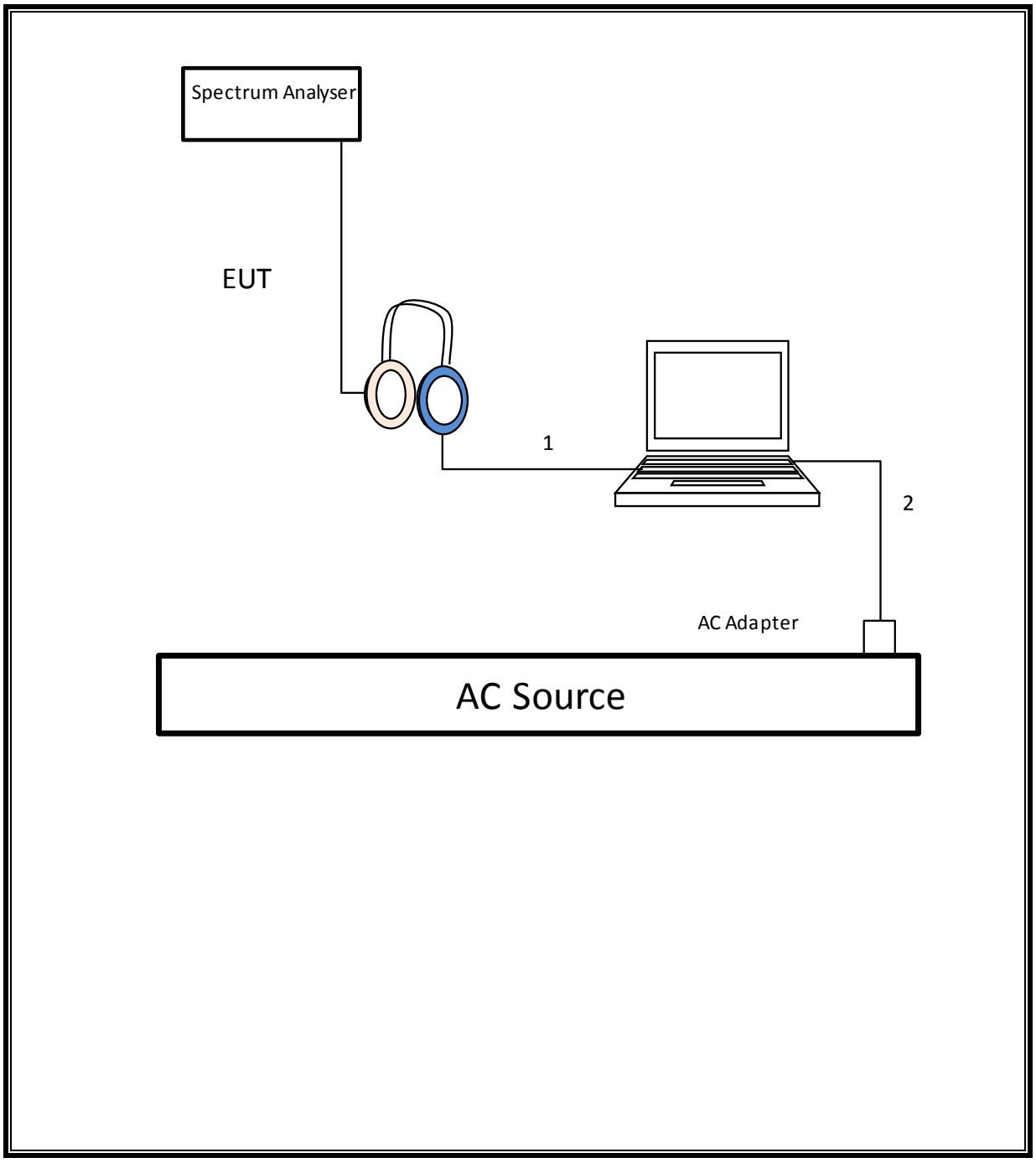
I/O CABLES

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	SPI	1	USB	Unshielded	0.25	Including SPI to USB convertor
2	DC	1	Barrel	Unshielded	2	

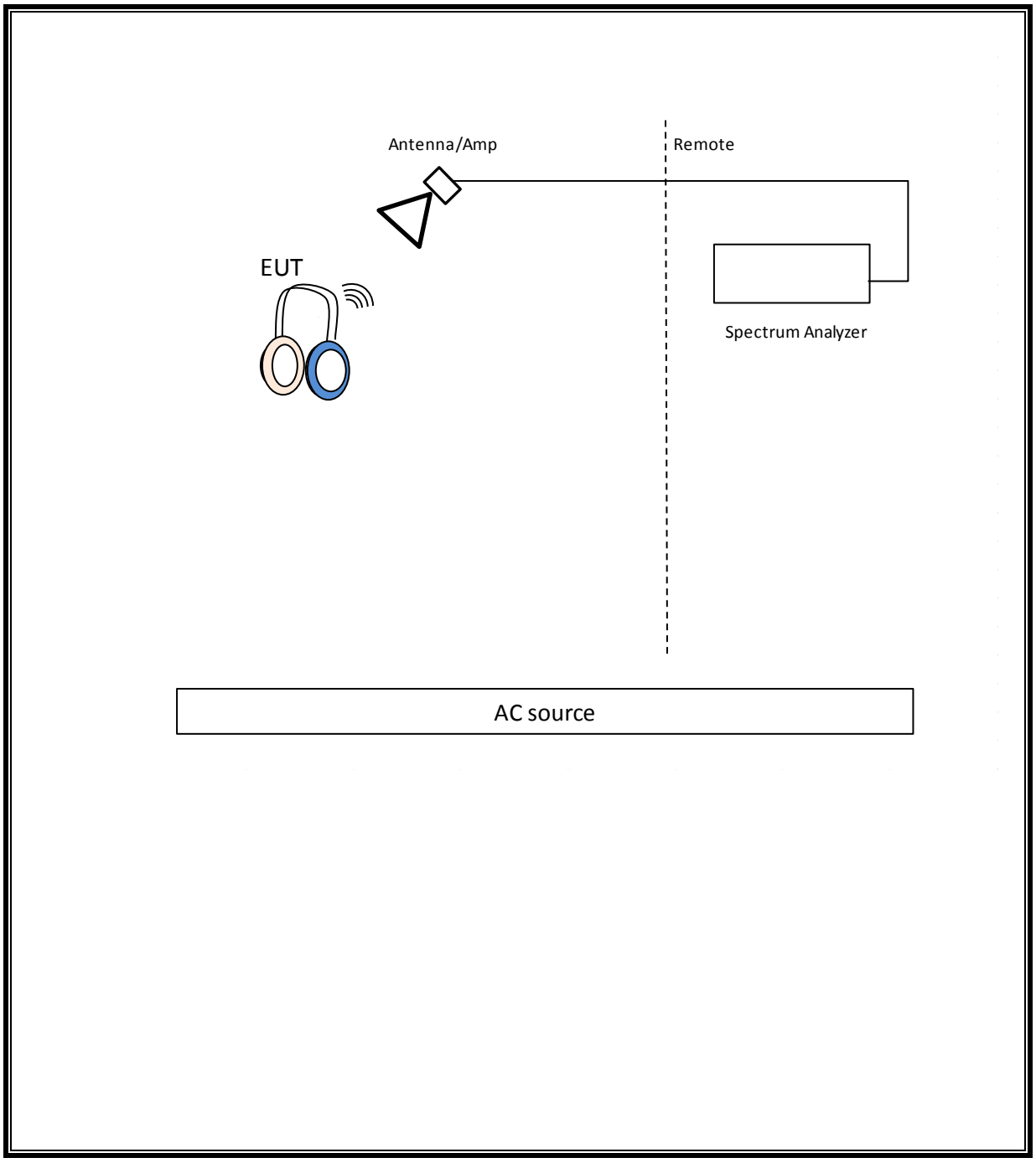
TEST SETUP

The EUT connects to a support laptop via USB cable, test software exercises the radio.

SETUP DIAGRAM FOR CONDUCTED TESTS



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**	**T No.**	**Cal Date**	**Cal Due**
Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014		
Conducted Software	UL	UL EMC	Ver 2.2, March 31, 2015		
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	341	02/20/15	02/20/16
Antenna, Horn 1-18GHz	ETS Lindgren	3117	120	03/26/15	03/26/16
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	122	02/13/15	02/13/16
Amplifier, 10KHz to 1GHz,	Sonoma	310N	173	06/07/14	06/07/15
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800 - 25-S-42	742	01/31/15	01/31/16
Filter, HPF 3.0GHz	Micro-Tronics	HPM17543	427	01/31/15	01/31/16
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	89	12/17/14	12/17/15
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Agilent	8449B	404	04/13/15	04/13/16
Spectrum Analyzer, 40 GHz	Agilent	8564E	106	08/06/14	08/06/15
LISN, 30MHz	FCC	50/250-25-2	24	01/16/15	01/16/16
Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	917	05/08/15	05/08/16

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

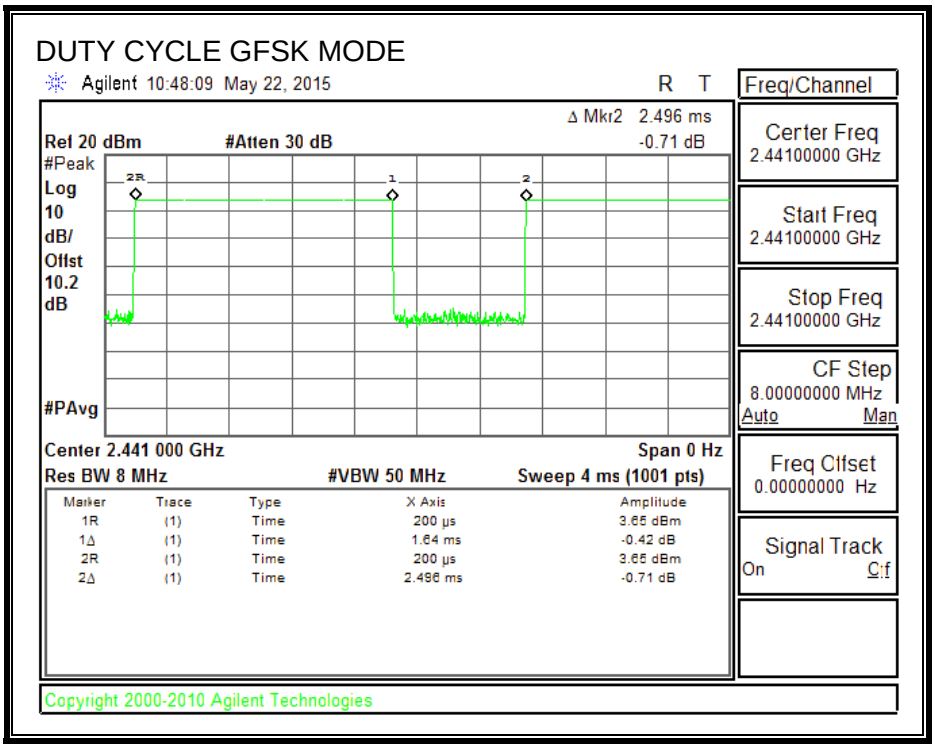
KDB 558074 Zero-Span Spectrum Analyzer Method.

7.1.1. ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4 GHz band (Hopping OFF)						
GFSK	1.640	2.496	0.657	65.71%	1.82	0.610

7.1.2. DUTY CYCLE PLOTS

HOPPING OFF



7.2. BASIC DATA RATE GFSK MODULATION

7.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

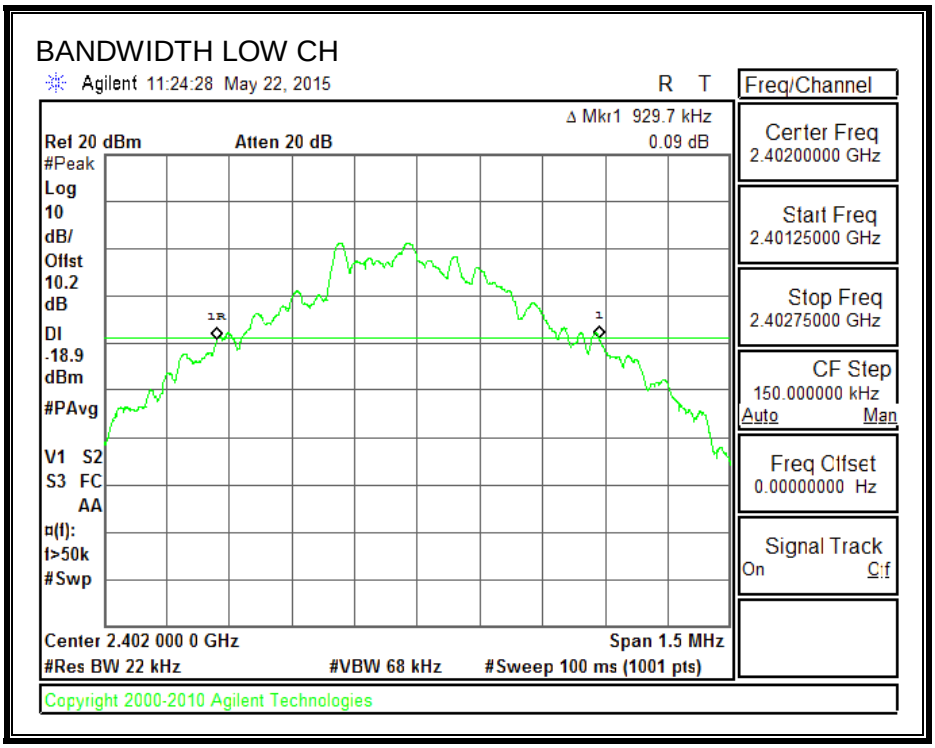
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

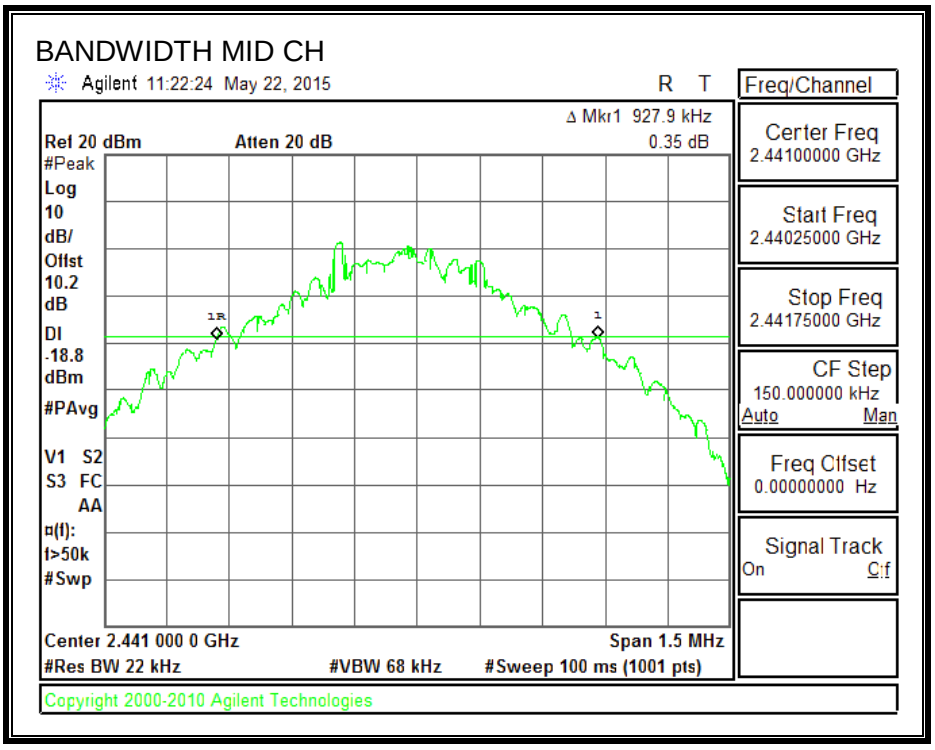
RESULTS

GFSK

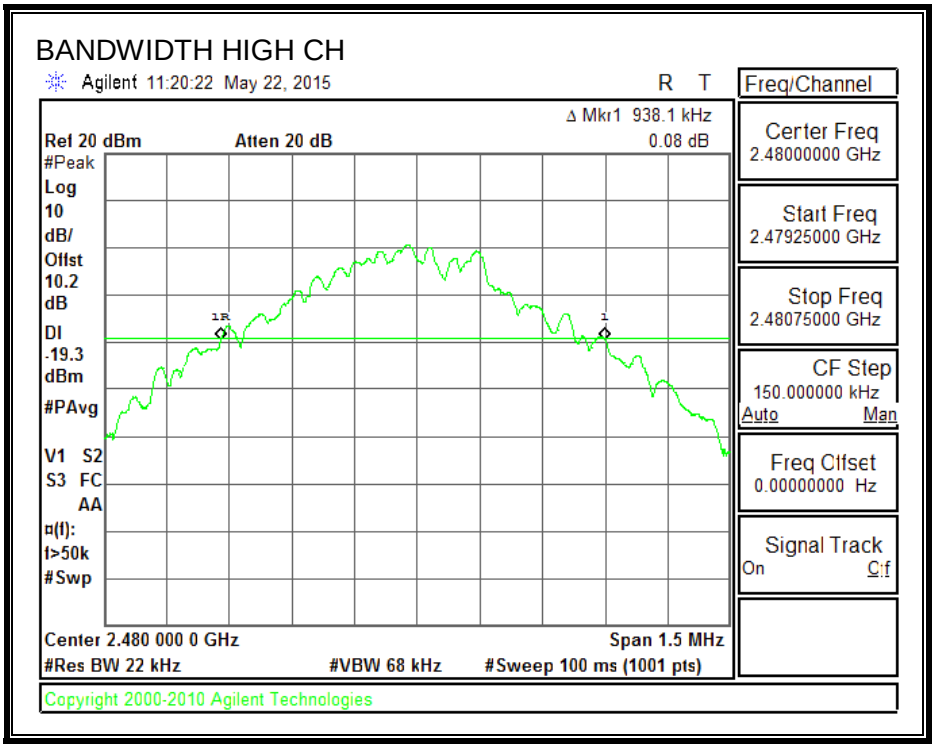
Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	929.7	843.4
Middle	2441	927.9	878.2
High	2480	938.1	873.6

GFSK 20 dB BANDWIDTH

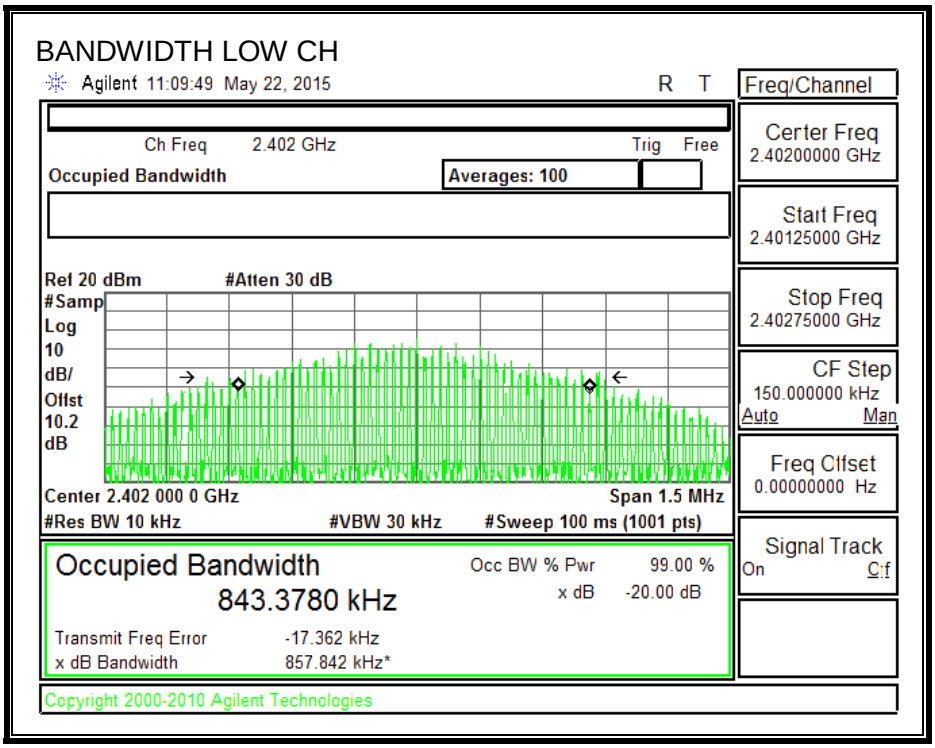


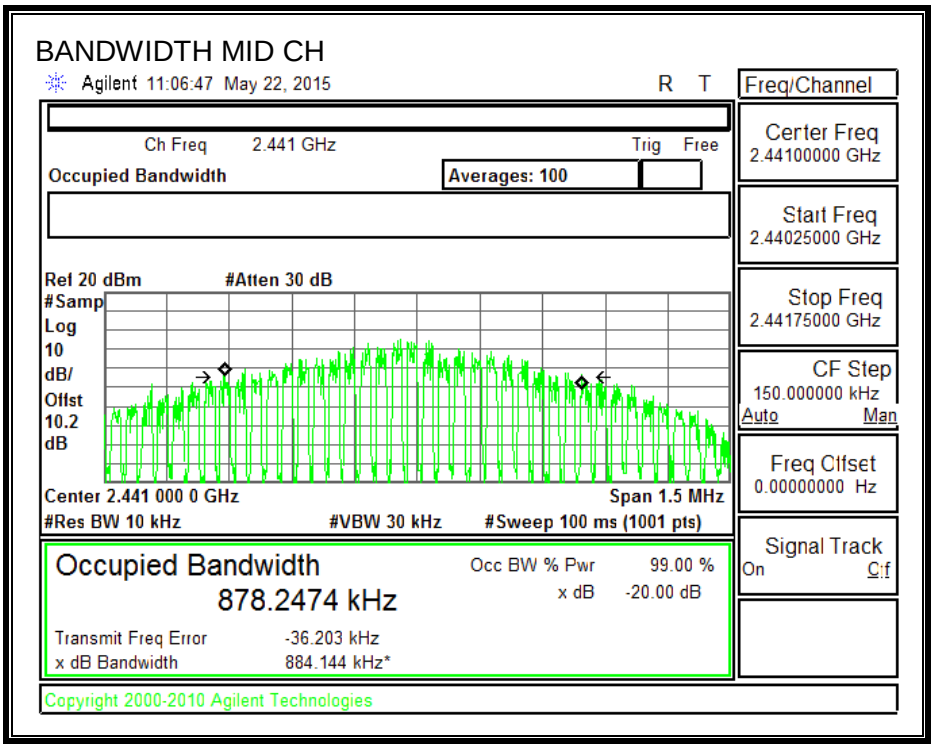


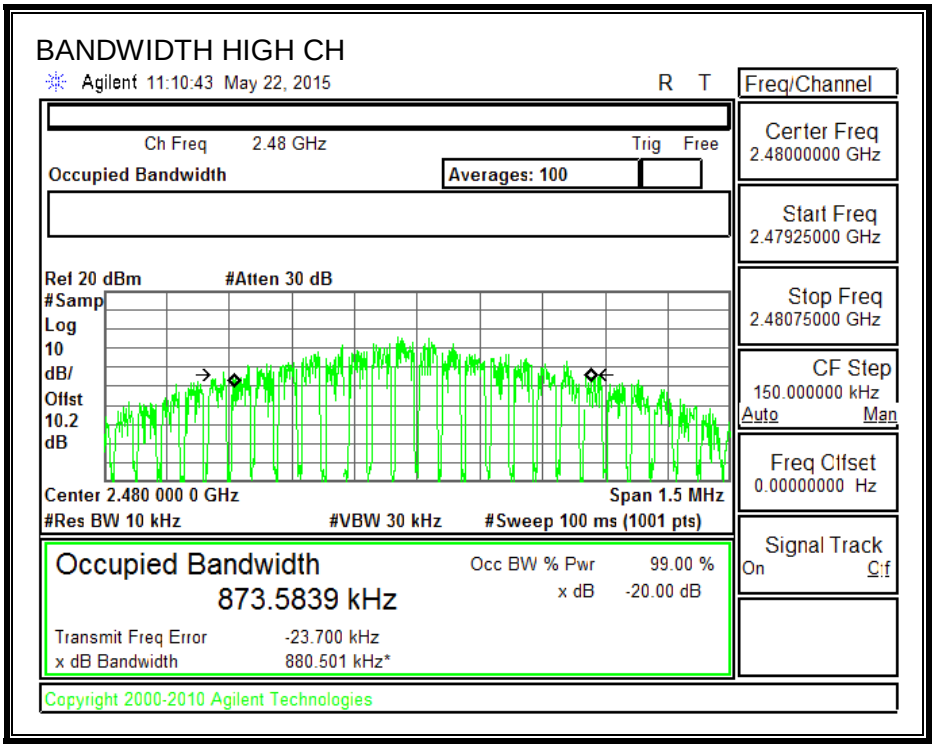
BANDWIDTH HIGH CH



GFSK 99% BANDWIDTH







7.2.3. HOPPING FREQUENCY SEPARATION

LIMIT

FCC §15.247 (a) (1)

IC RSS-247 5.1 (2)

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.

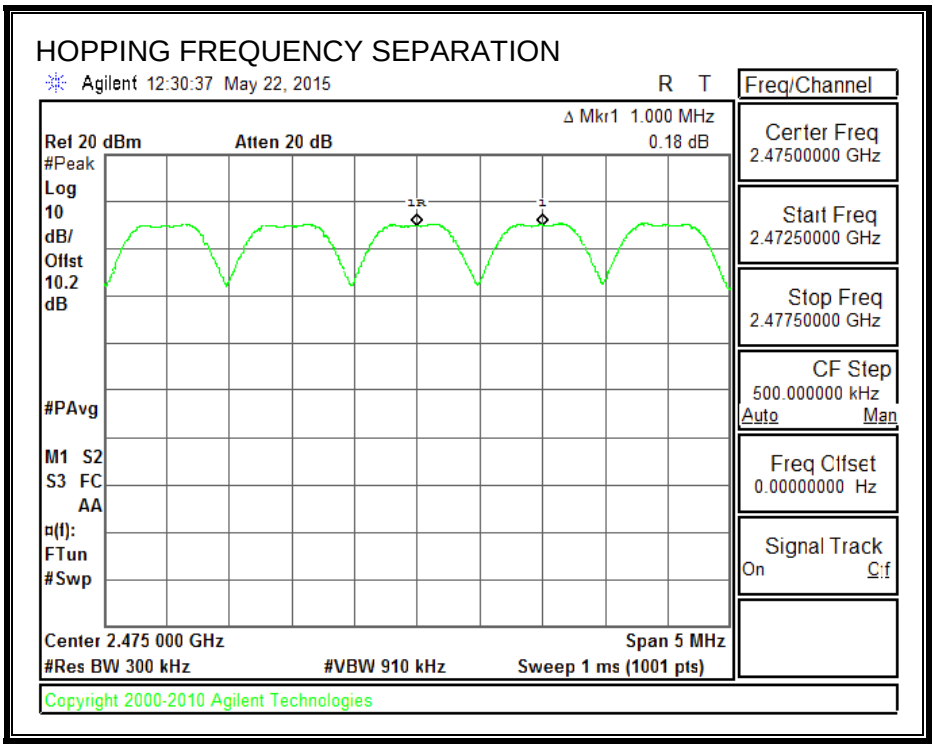
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 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 900 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION



7.2.4. NUMBER OF HOPPING CHANNELS

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1 (4)

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

TEST PROCEDURE

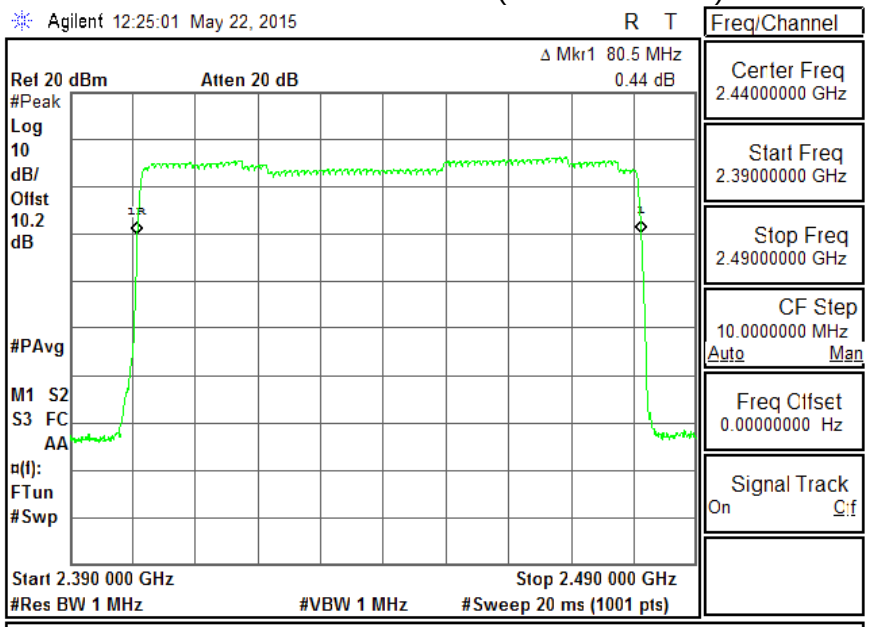
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

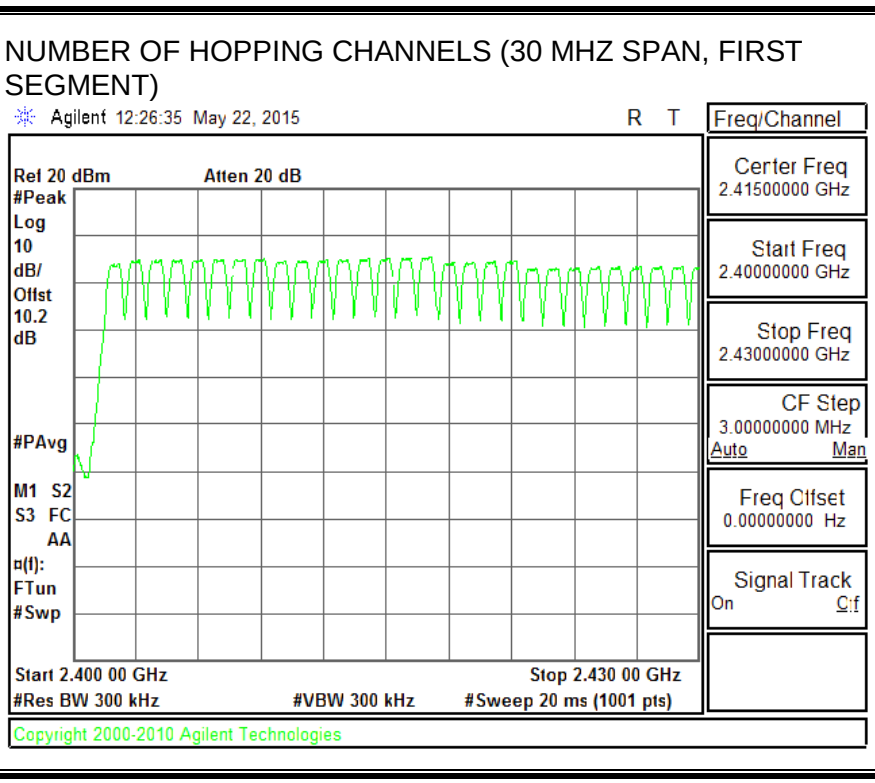
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS

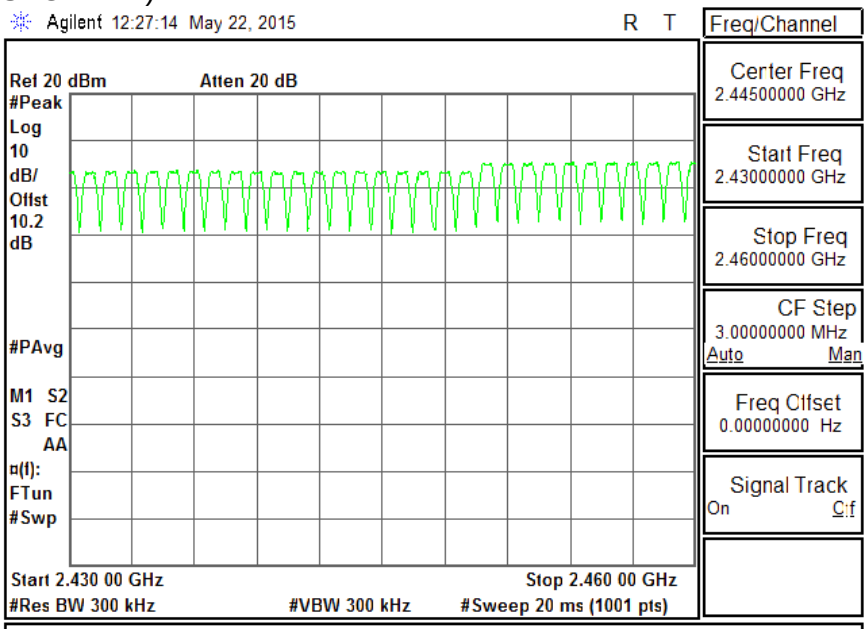
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



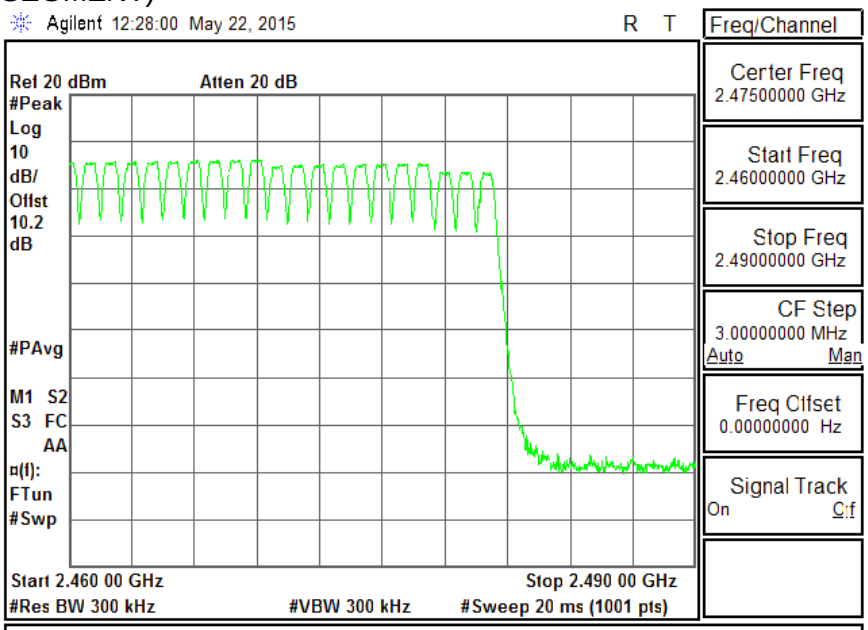
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



7.2.5. AVERAGE TIME OF OCCUPANCY

LIMIT

FCC §15.247 (a) (1) (iii)

IC RSS-247 5.1 (4)

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.

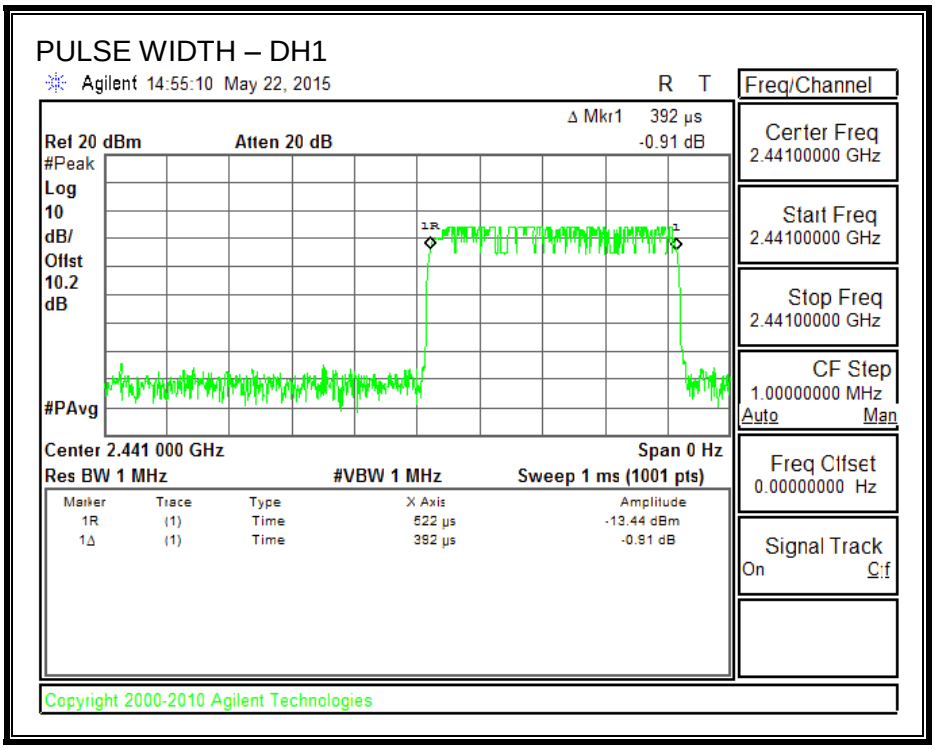
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

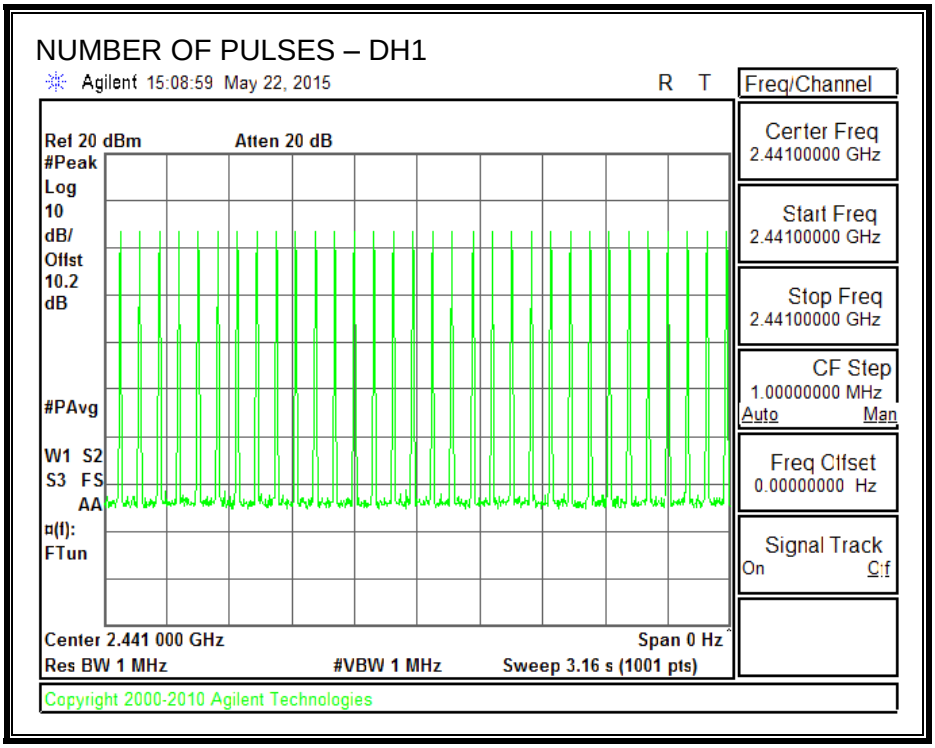
RESULTS

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.392	32	0.125	0.4	-0.275
DH3	1.6	16	0.256	0.4	-0.144
DH5	2.863	11	0.315	0.4	-0.085
DH Packet	Pulse Width (msec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.392	8	0.031	0.4	-0.369
DH3	1.6	4	0.064	0.4	-0.336
DH5	2.863	2.75	0.079	0.4	-0.321

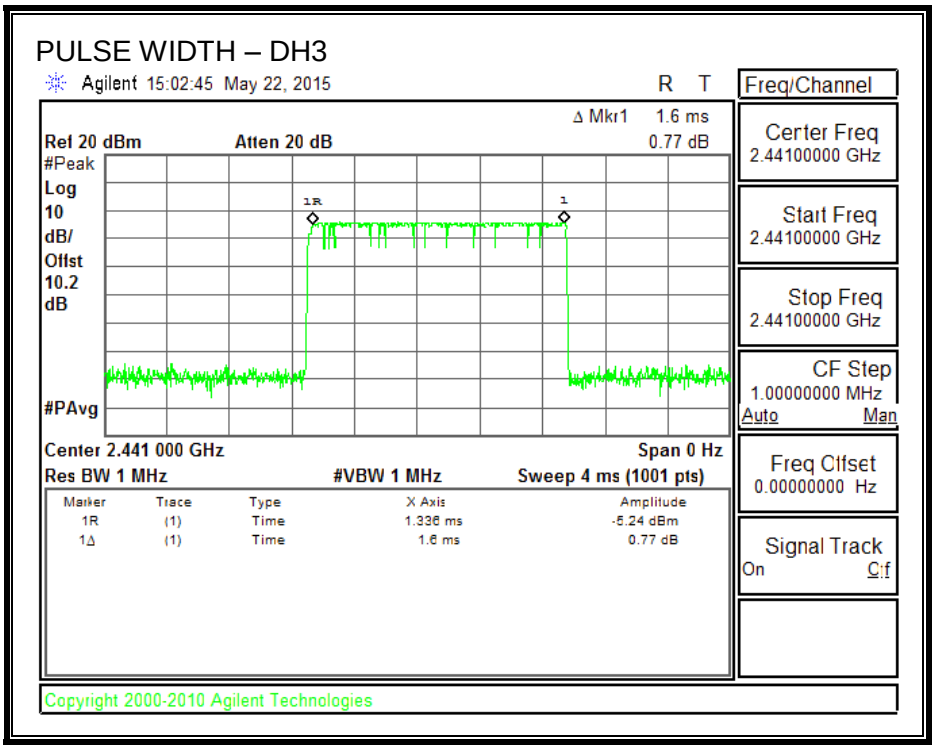
PULSE WIDTH - DH1



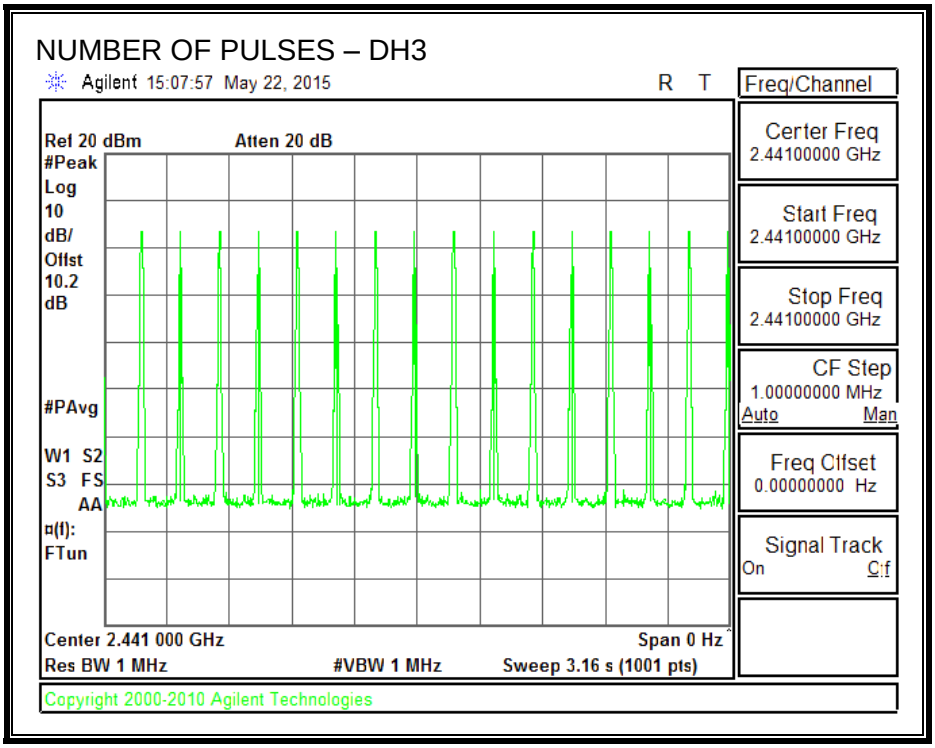
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



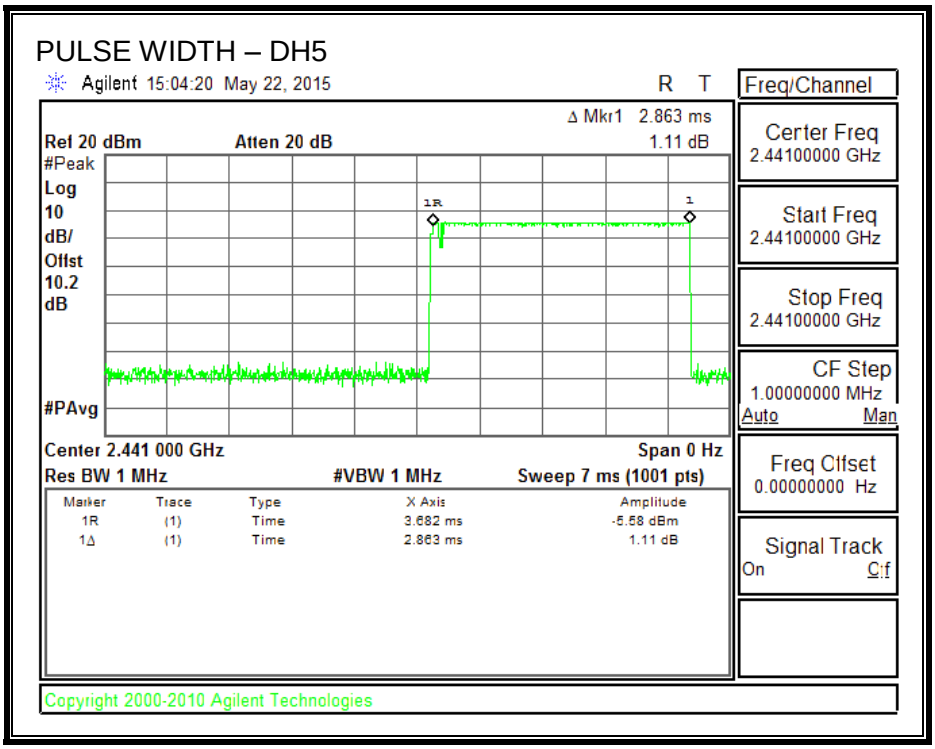
PULSE WIDTH – DH3



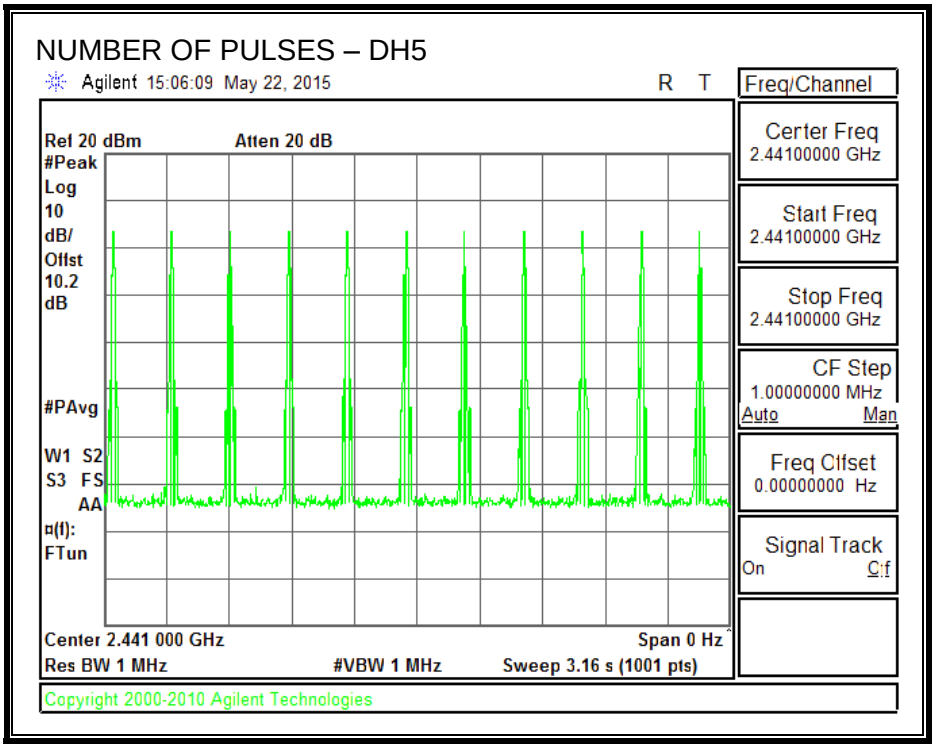
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.2.6. OUTPUT POWER

LIMIT

§15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

RSS-247 Clause 5.4 (2)

For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W.

TEST PROCEDURE

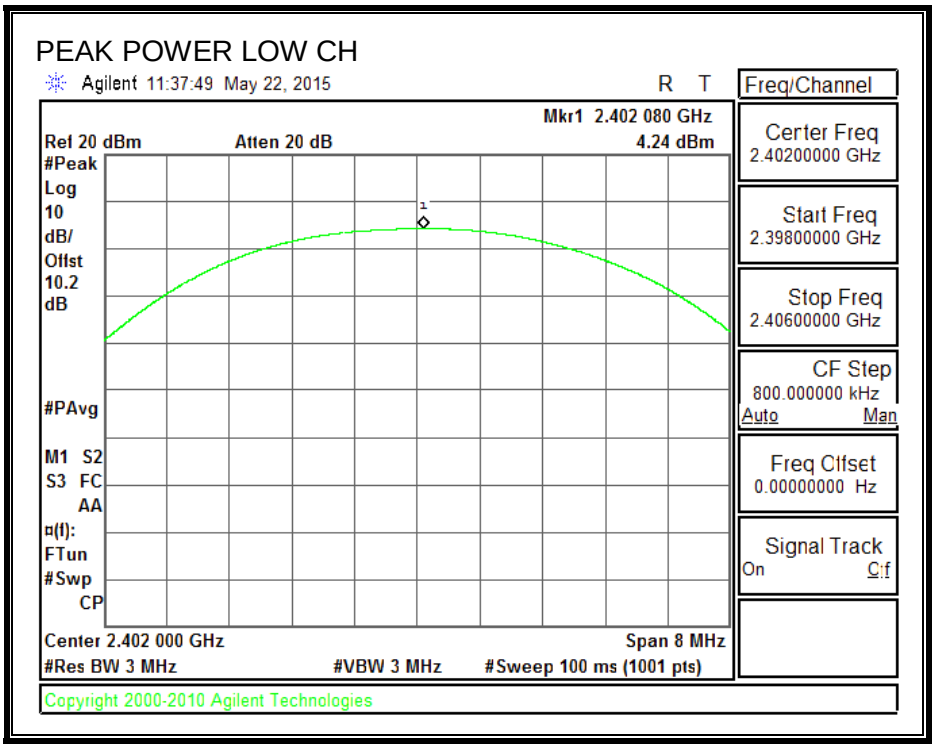
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

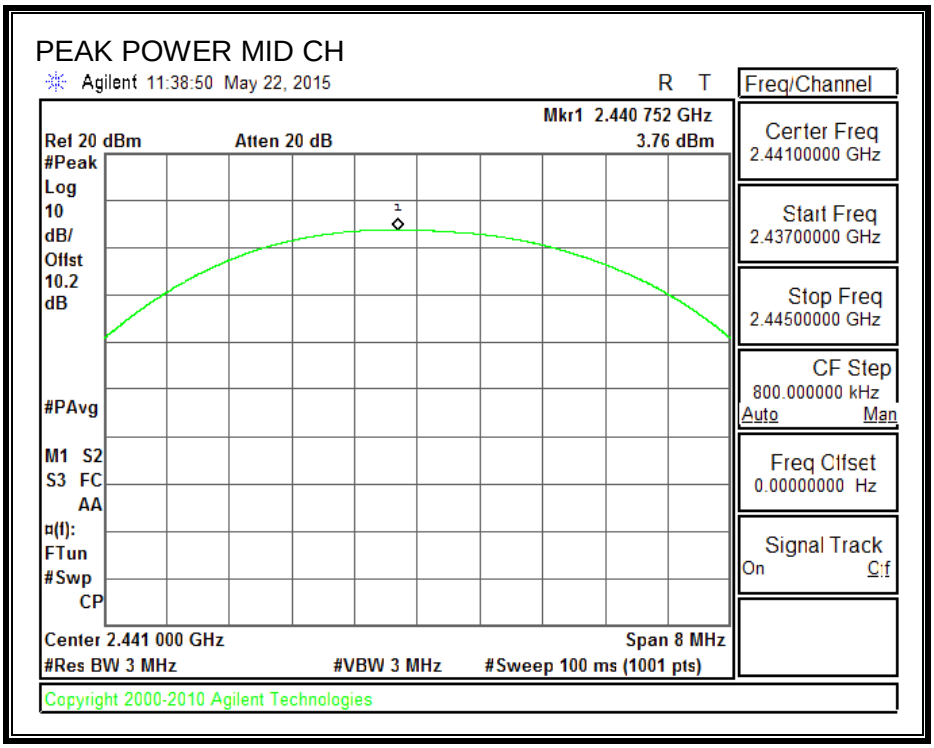
RESULTS

GFSK

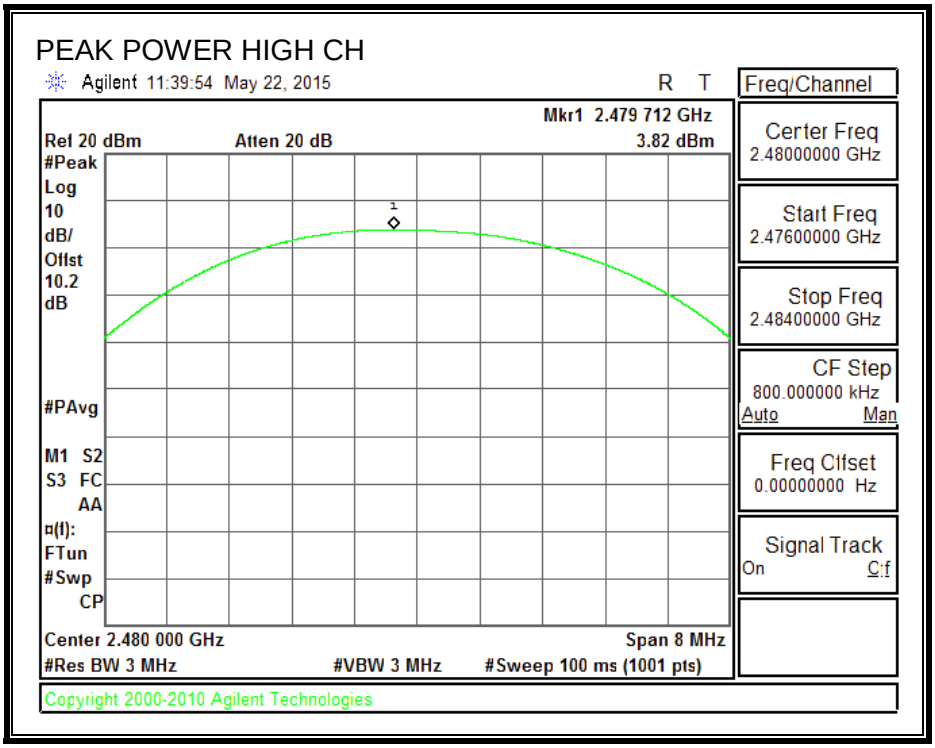
Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	4.240	0.50	21	-16.76
Middle	2441	3.760	0.50	21	-17.24
High	2480	3.820	0.50	21	-17.18

GFSK OUTPUT POWER





PEAK POWER HIGH CH



7.2.8. 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 10.12 dB (including 10 dB pad and 0.12 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

GFSK

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	1.90
Middle	2441	1.70
High	2480	1.60

7.2.9. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

IC RSS-247 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

TEST PROCEDURE

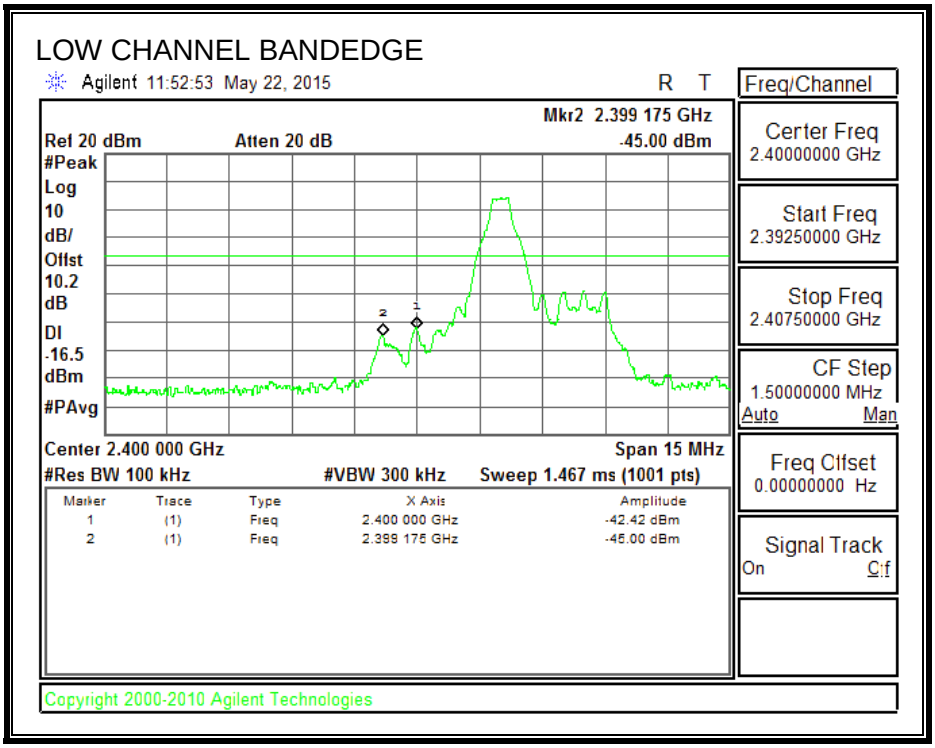
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

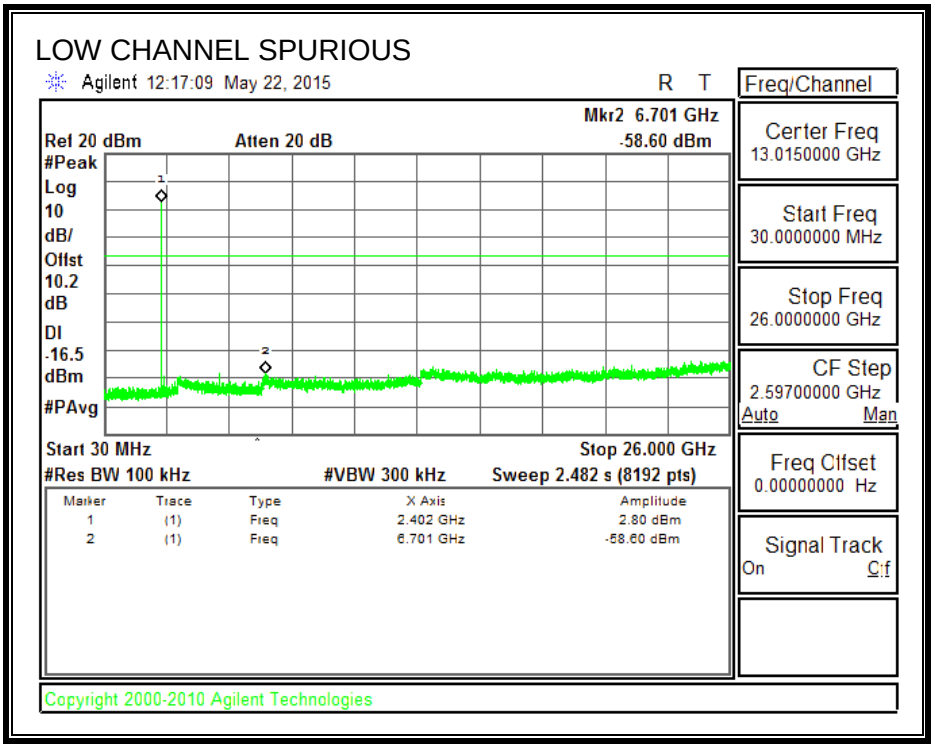
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

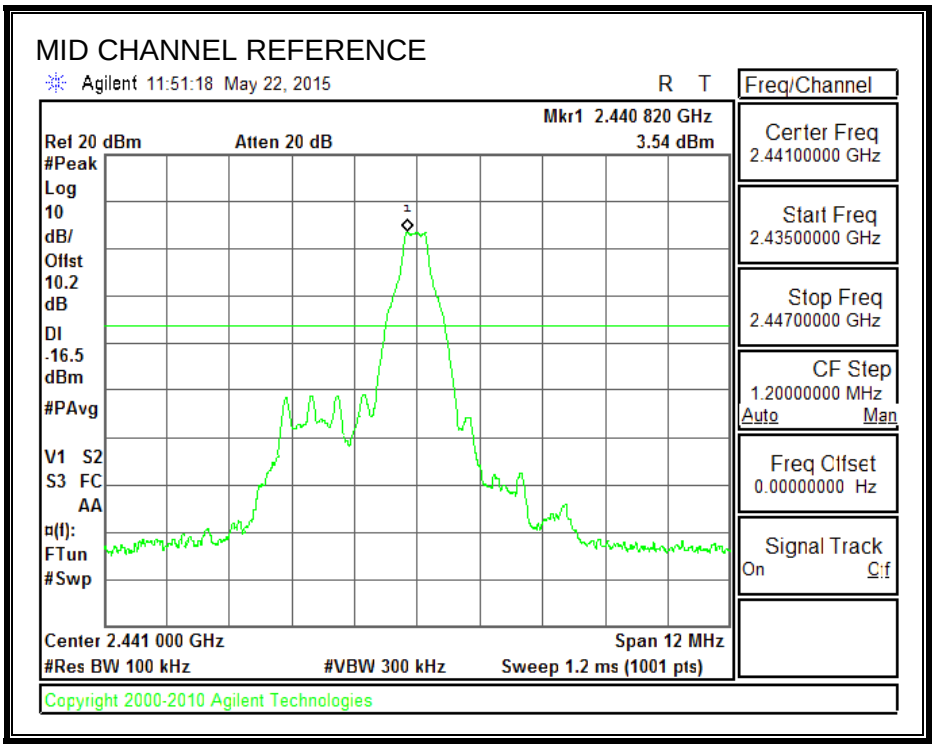
RESULTS

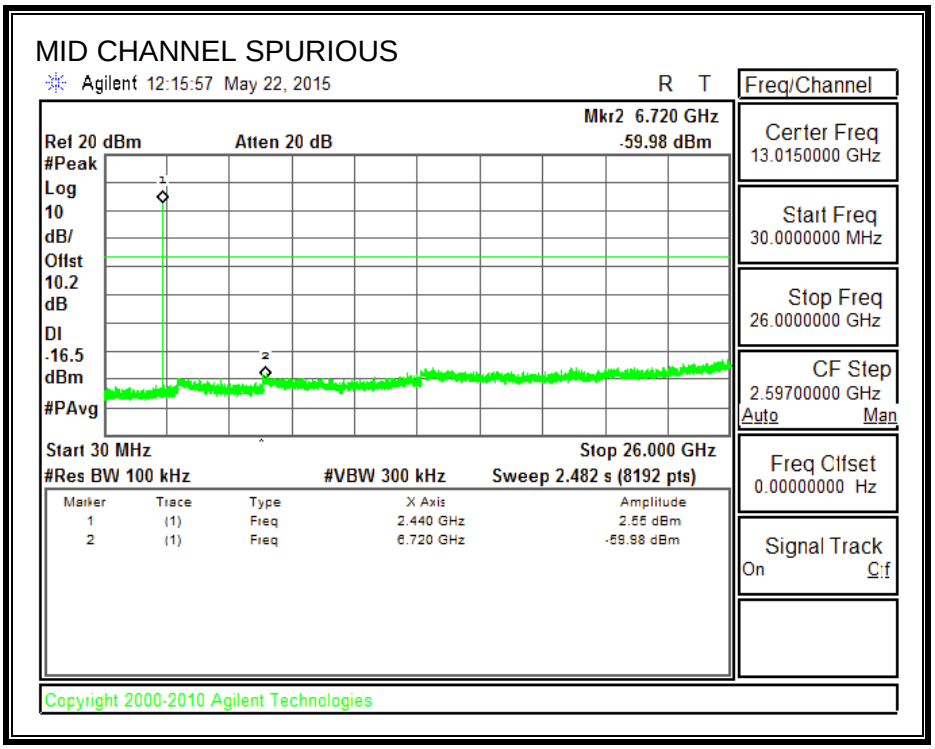
GFSK SPURIOUS EMISSIONS, LOW CHANNEL



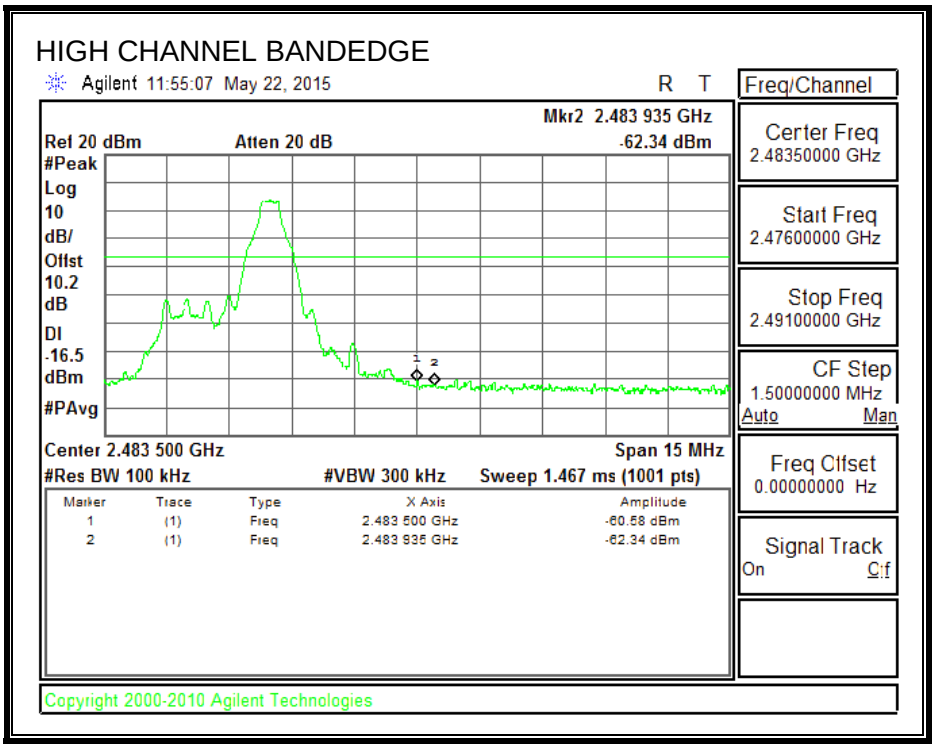


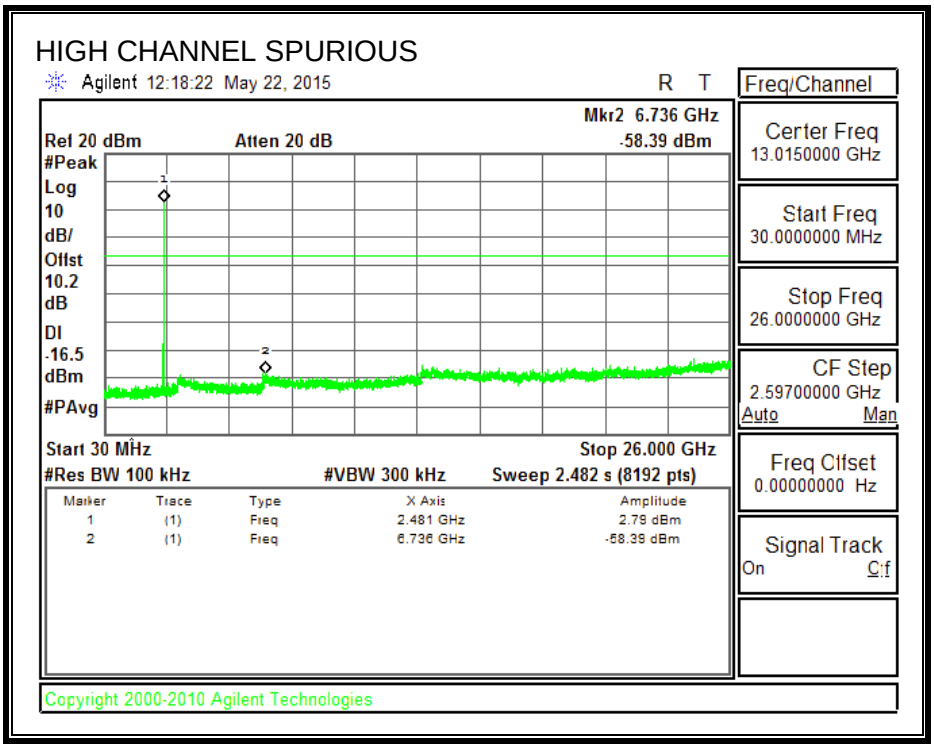
SPURIOUS EMISSIONS, MID CHANNEL





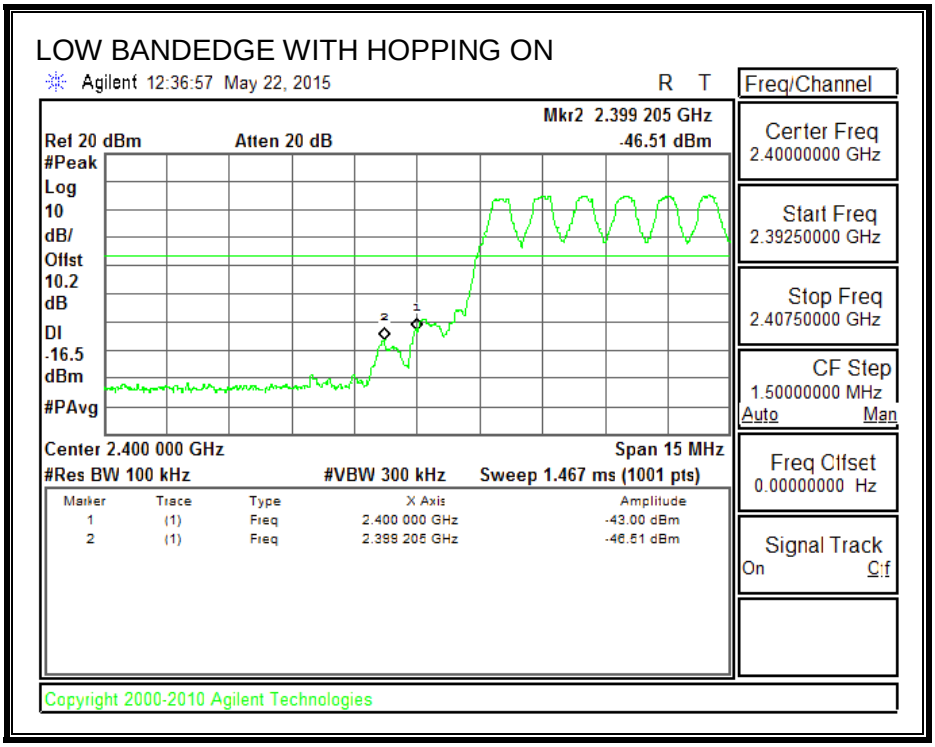
SPURIOUS EMISSIONS, HIGH CHANNEL



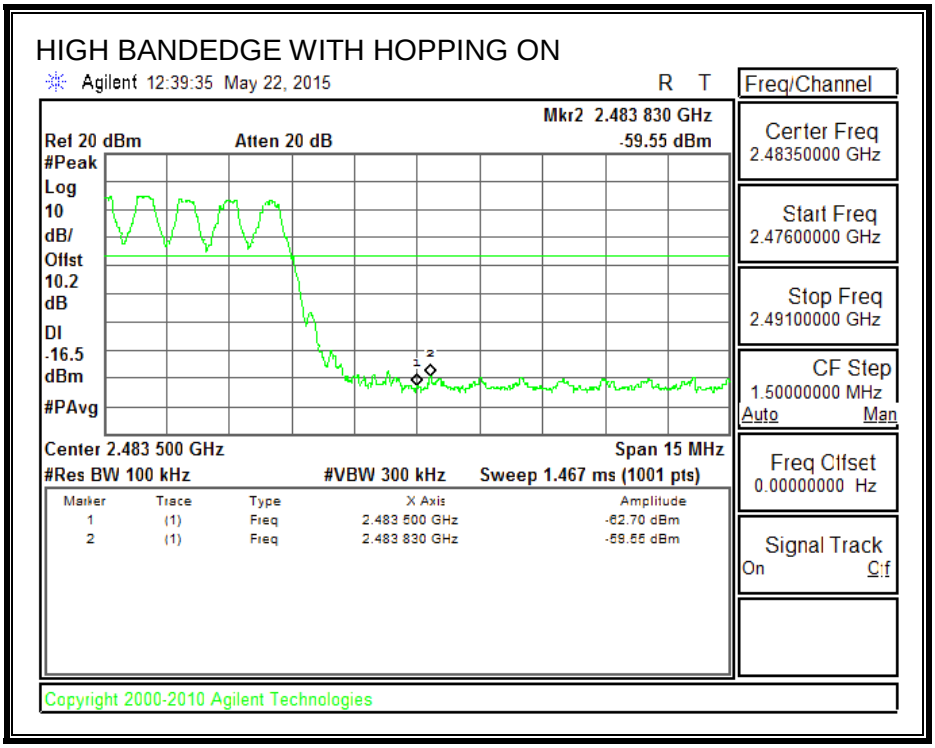


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

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

IC RSS-GEN Clause 8.9 (Transmitter)

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 for below 1GHz and 150cm for above 1GHz. The antenna to EUT distance is 3 meters.

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; the video bandwidth is set to 1 MHz for peak measurements and as applicable 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 each applicable band.

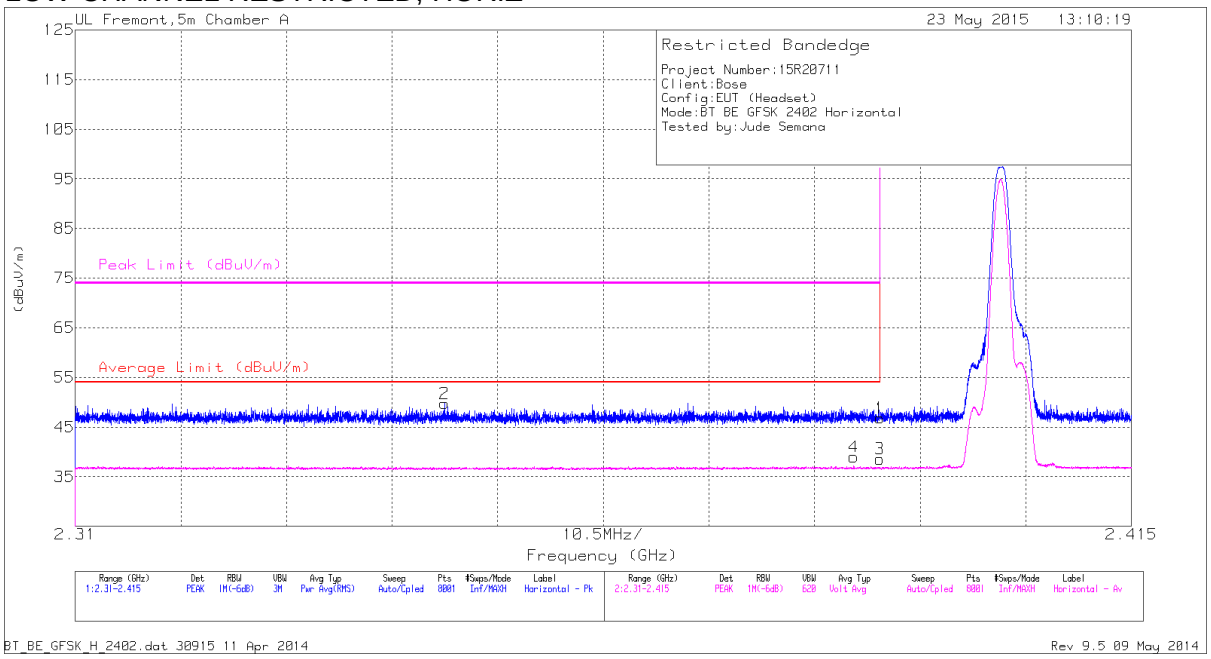
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

LOW CHANNEL RESTRICTED, HORIZ

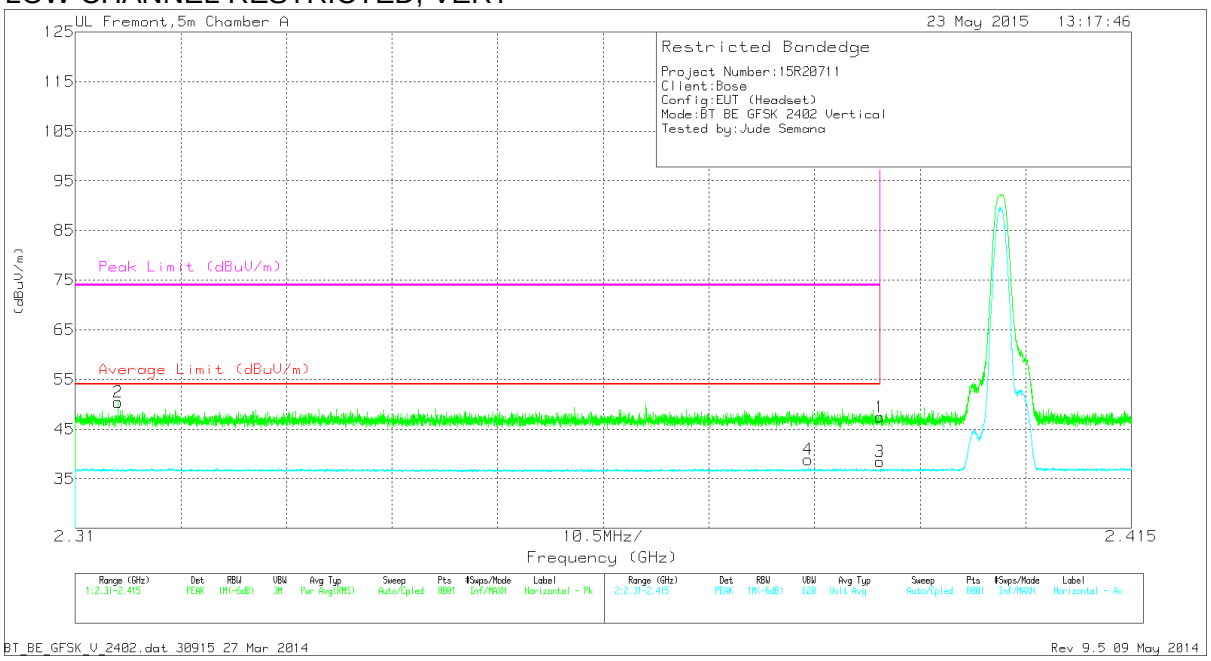


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	39.69	PK	32	-24.9	0	46.79	-	-	74	-27.21	141	299	H
2	2.347	42.87	PK	31.9	-25	0	49.77	-	-	74	-24.23	141	299	H
3	2.39	31.47	VB1T	32	-24.9	0	38.57	54	-15.43	-	-	141	299	H
4	2.387	31.89	VB1T	32	-24.9	0	38.99	54	-15.01	-	-	141	299	H

PK - Peak detector
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

LOW CHANNEL RESTRICTED, VERT



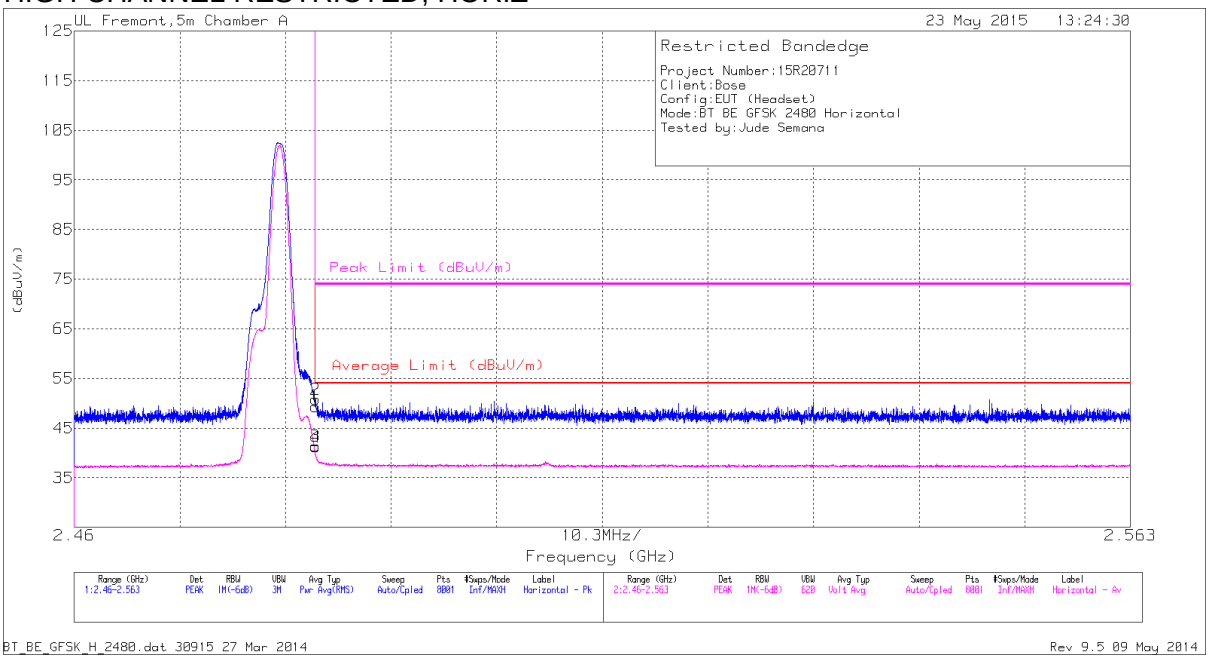
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.39	40.32	PK	32	-24.9	0	47.42	-	-	74	-26.58	151	276	V
2	2.314	43.41	PK	31.9	-24.9	0	50.41	-	-	74	-23.59	151	276	V
3	2.39	31.35	VB1T	32	-24.9	0	38.45	54	-15.55	-	-	151	276	V
4	2.383	31.85	VB1T	31.9	-24.9	0	38.85	54	-15.15	-	-	151	276	V

PK - Peak detector
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL RESTRICTED, HORIZ

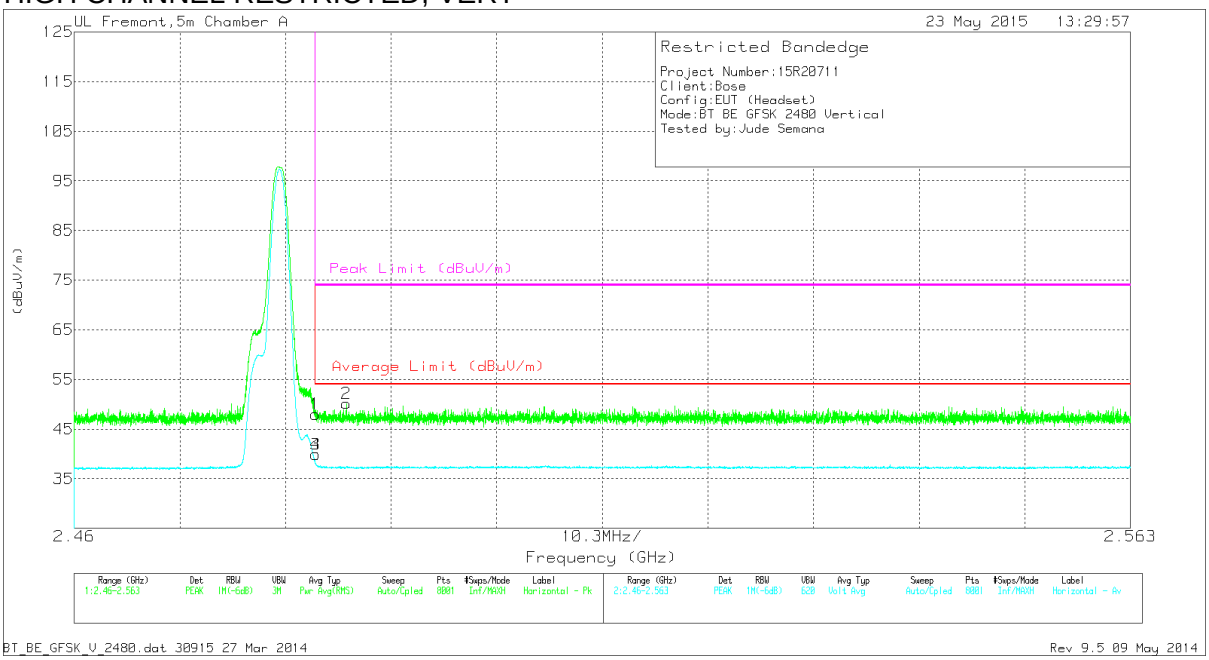


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	41.99	PK	32.1	-24.8	0	49.29	-	-	74	-24.71	104	224	H
2	2.484	43.49	PK	32.1	-24.8	0	50.79	-	-	74	-23.21	104	224	H
3	2.484	34.08	VB1T	32.1	-24.8	0	41.38	54	-12.62	-	-	104	224	H
4	2.484	33.92	VB1T	32.1	-24.8	0	41.22	54	-12.78	-	-	104	224	H

PK - Peak detector
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HIGH CHANNEL RESTRICTED, VERT



Trace Markers

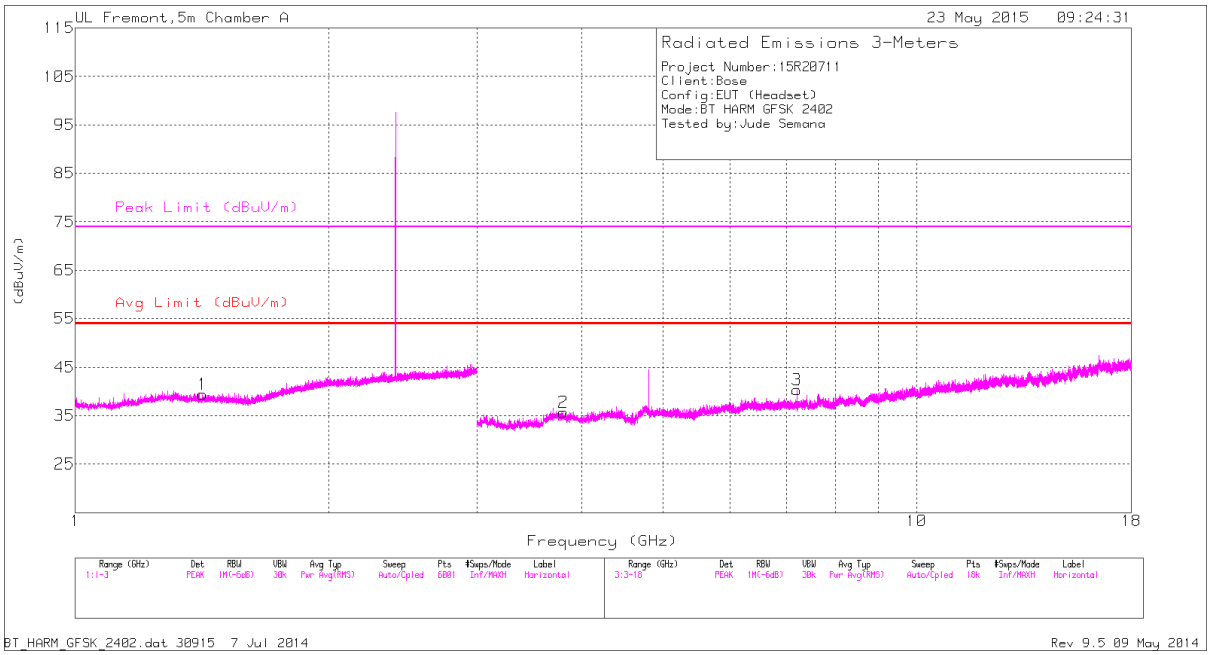
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.484	40.67	PK	32.1	-24.8	0	47.97	-	-	74	-26.03	242	156	V
2	2.487	42.84	PK	32.1	-24.8	0	50.14	-	-	74	-23.86	242	156	V
3	2.484	32.61	VB1T	32.1	-24.8	0	39.91	54	-14.09	-	-	242	156	V
4	2.484	32.61	VB1T	32.1	-24.8	0	39.91	54	-14.09	-	-	242	156	V

PK - Peak detector
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

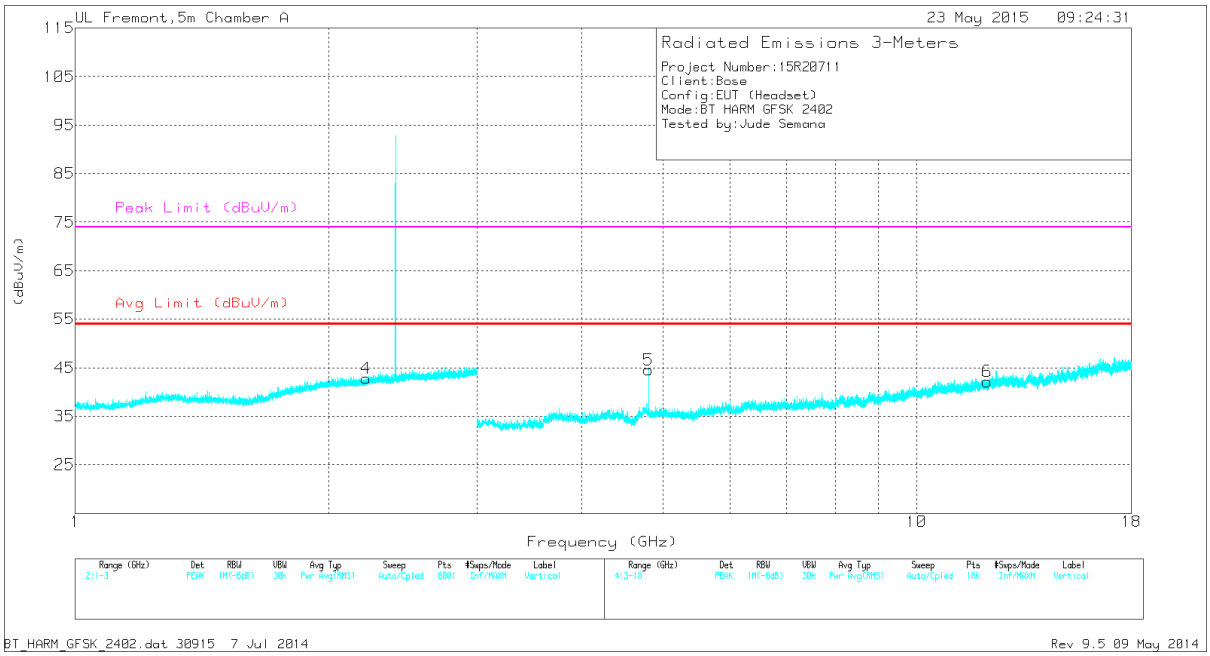
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL

HORIZONTAL



VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.416	36.91	PK	28.5	-26	0	39.41	-	-	74	-34.59	0-360	100	H
4	2.216	36.52	PK	31.4	-25.1	0	42.82	-	-	74	-31.18	0-360	201	V
2	3.8	34.92	PK	33.4	-32.6	0	35.72	-	-	74	-38.28	0-360	201	H
3	7.206	32.12	PK	35.5	-27.3	0	40.32	-	-	-	-	0-360	201	H
5	4.804	41.64	PK	34	-31.1	0	44.54	-	-	74	-29.46	0-360	100	V
6	12.128	26.65	PK	38.8	-23.3	0	42.15	-	-	74	-31.85	0-360	201	V

PK - Peak detector

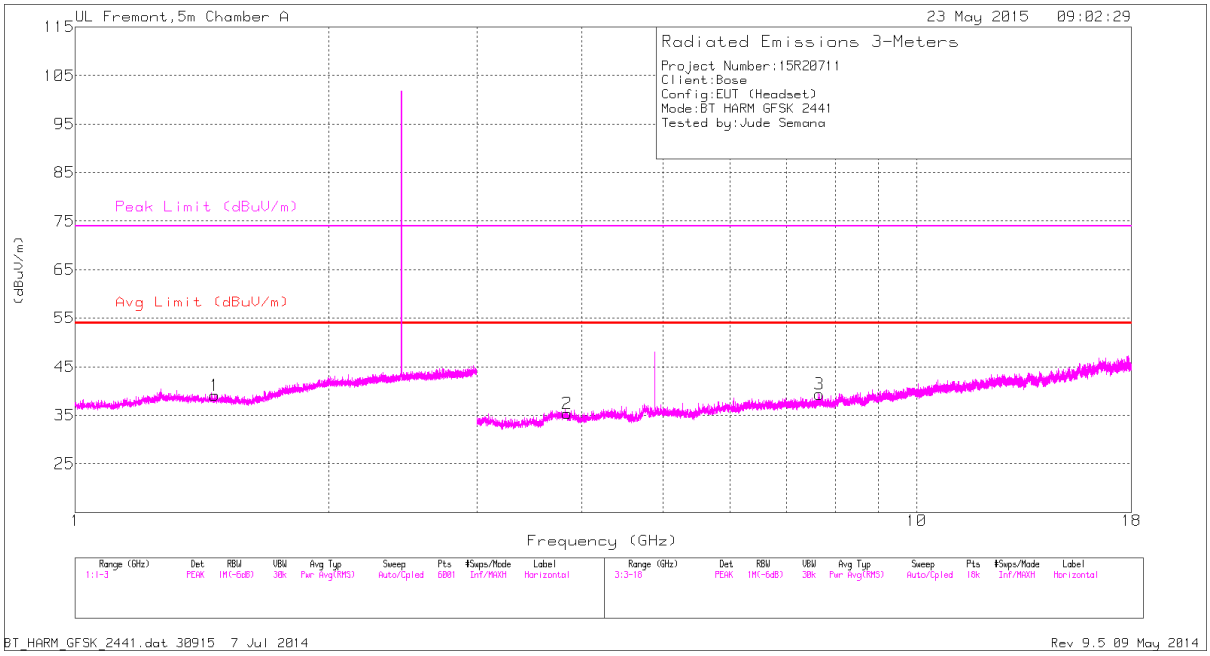
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.804	46.41	PK3	34	-31.1	0	49.31	-	-	74	-24.69	163	100	V
4.804	40.5	VB1T	34	-31.1	0	43.4	54	-10.6	-	-	163	100	V

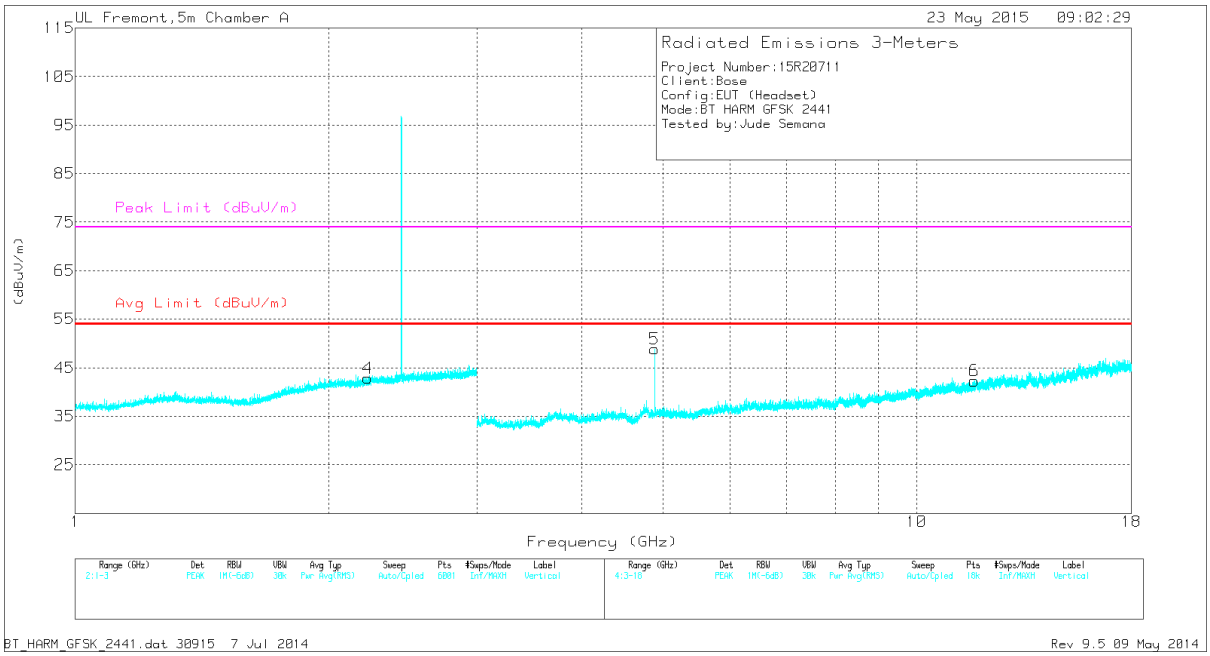
PK3 - FHSS Method: Maximum Peak
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

MID CHANNEL

HORIZONTAL



VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.464	36.84	PK	28.2	-25.9	0	39.14	-	-	74	-34.86	0-360	201	H
4	2.227	36.46	PK	31.5	-25.1	0	42.86	-	-	74	-31.14	0-360	201	V
2	3.845	34.51	PK	33.4	-32.5	0	35.41	-	-	74	-38.59	0-360	201	H
3	7.66	29.64	PK	35.6	-25.9	0	39.34	-	-	74	-34.66	0-360	201	H
5	4.882	44.94	PK	33.9	-30	0	48.84	-	-	74	-25.16	0-360	100	V
6	11.708	26.89	PK	38.3	-22.9	0	42.29	-	-	74	-31.71	0-360	201	V

PK - Peak detector

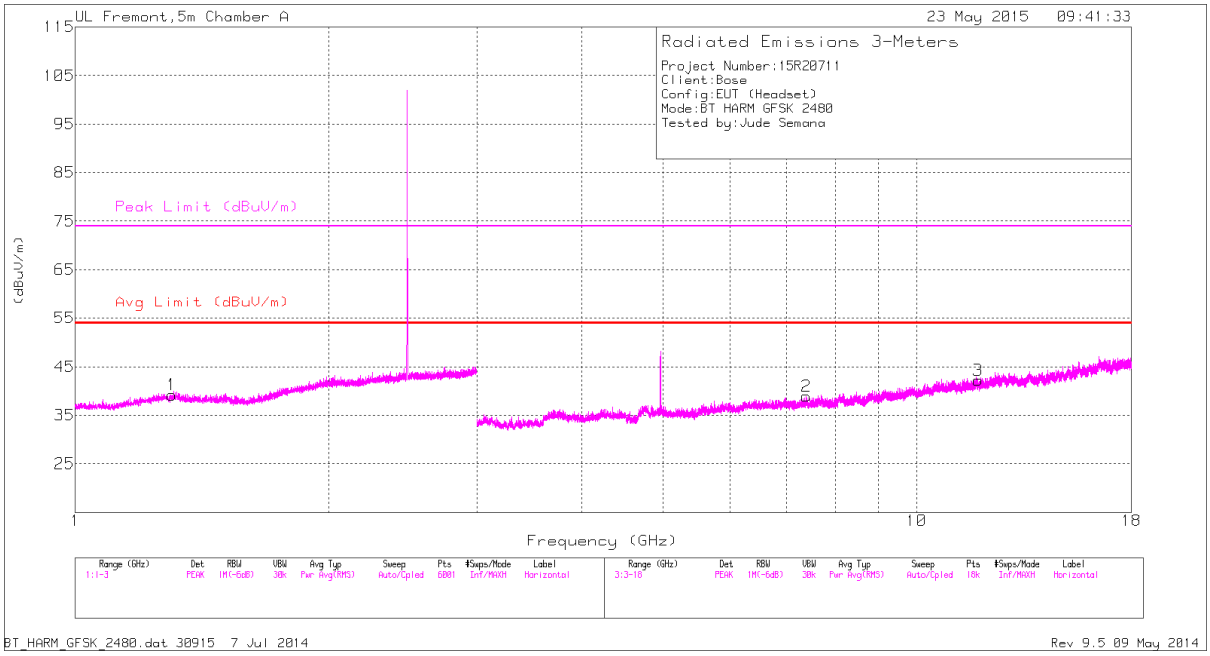
Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.882	48.37	PK3	33.9	-30	0	52.27	-	-	74	-21.73	248	160	V
4.882	44.55	VB1T	33.9	-30	0	48.45	54	-5.55	-	-	248	160	V

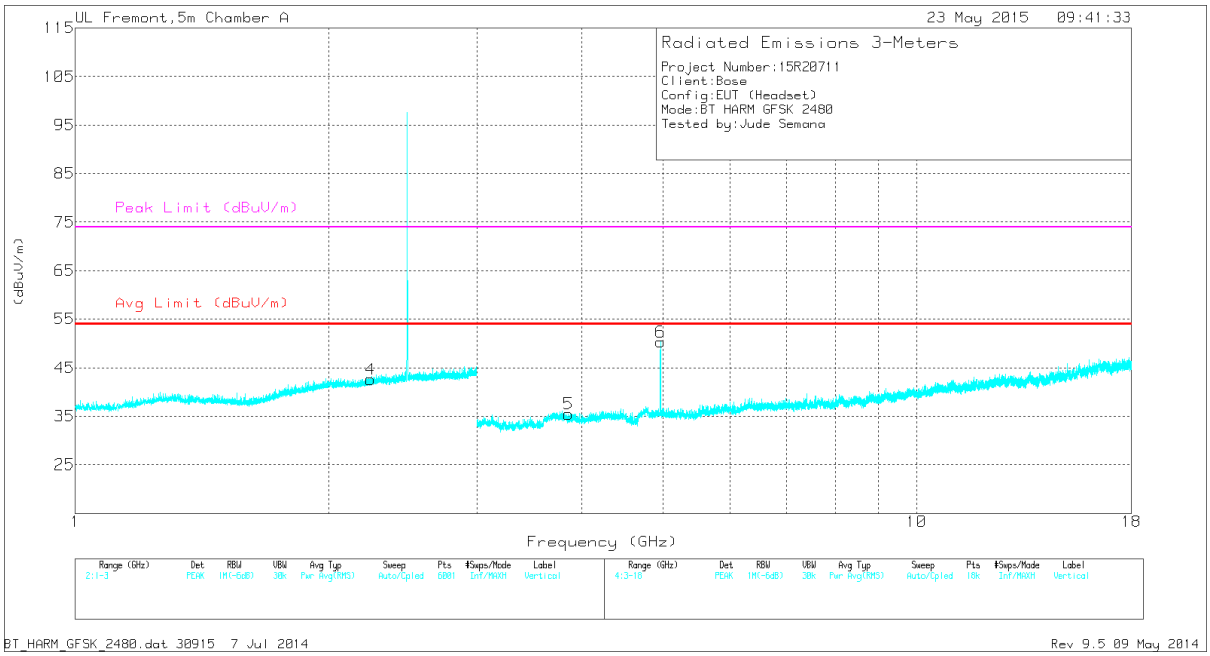
PK3 - FHSS Method: Maximum Peak
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HIGH CHANNEL

HORIZONTAL



VERTICAL



Note: Emission was scanned up to 26GHz; No emissions were detected above the noise floor which was at least 20dB below the specification limit.

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.303	36.49	PK	28.8	-26.1	0	39.19	-	-	74	-34.81	0-360	100	H
4	2.243	36.09	PK	31.5	-25	0	42.59	-	-	74	-31.41	0-360	201	V
2	7.395	29.2	PK	35.5	-25.8	0	38.9	-	-	74	-35.1	0-360	100	H
3	11.83	26.81	PK	38.4	-23	0	42.21	-	-	74	-31.79	0-360	201	H
5	3.856	34.46	PK	33.4	-32.4	0	35.46	-	-	74	-38.54	0-360	201	V
6	4.96	46.34	PK	33.9	-29.9	0	50.34	-	-	74	-23.66	0-360	100	V

PK - Peak detector

Radiated Emissions

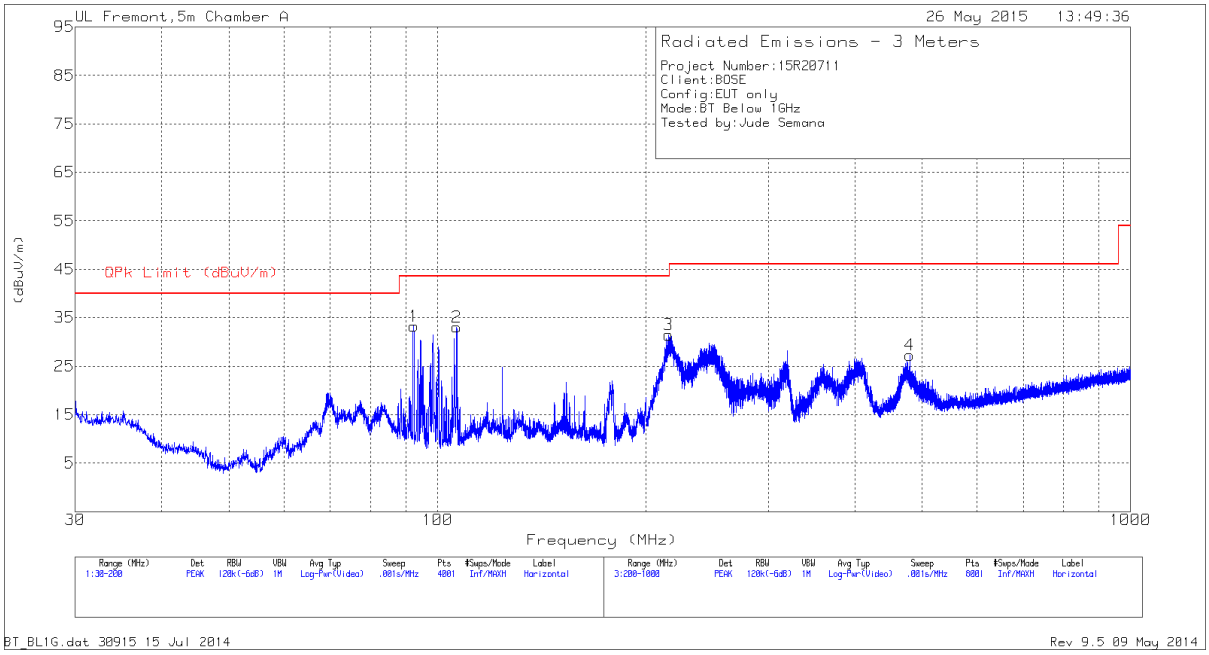
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4.96	48.8	PK3	33.9	-29.9	0	52.8	-	-	74	-21.2	186	100	V
4.96	45.32	VB1T	33.9	-29.9	0	49.32	54	-4.68	-	-	186	100	V

PK3 - FHSS Method: Maximum Peak
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

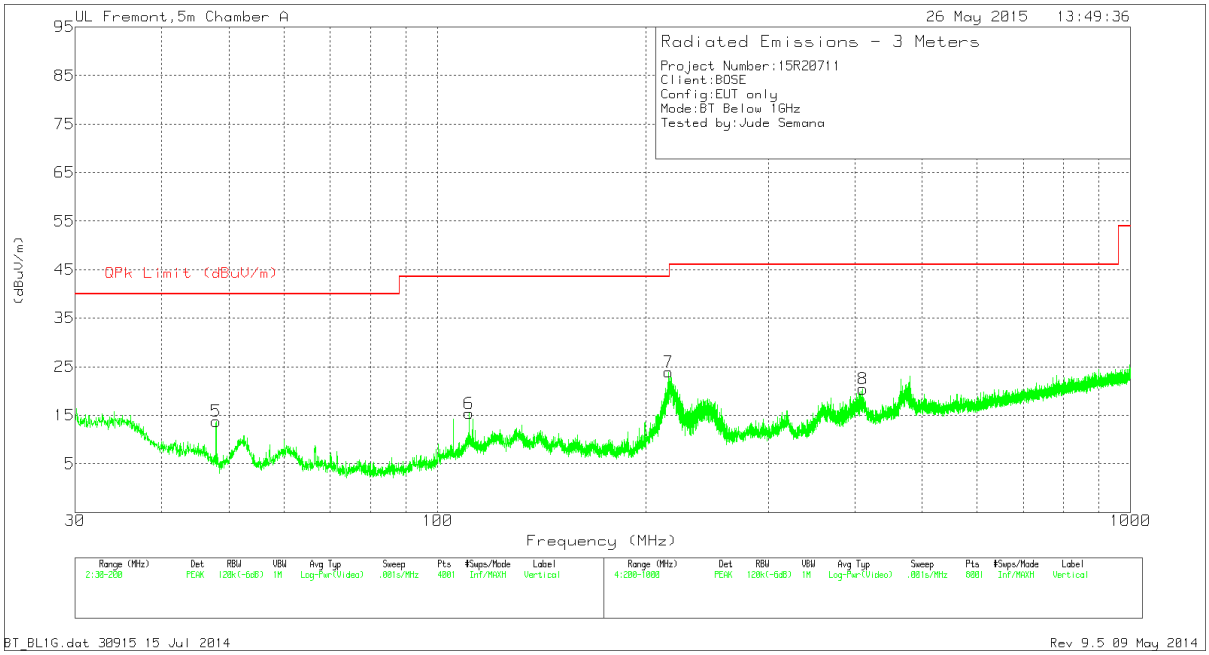
8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	92.39	55.68	PK	8.2	-30.6	33.28	43.52	-10.24	0-360	101	H
2	106.5	51.66	PK	11.9	-30.5	33.06	43.52	-10.46	0-360	101	H
5	47.935	35.95	PK	8.9	-31.1	13.75	40	-26.25	0-360	101	V
6	111.0475	33.18	PK	12.7	-30.5	15.38	43.52	-28.14	0-360	101	V
3	215.5	50.87	PK	10.5	-29.9	31.47	43.52	-12.05	0-360	200	H
4	480	38.46	PK	17.6	-28.8	27.26	46.02	-18.76	0-360	200	H
7	215.5	43.27	PK	10.5	-29.9	23.87	43.52	-19.65	0-360	200	V
8	410.7	33.73	PK	15.7	-29	20.43	46.02	-25.59	0-360	101	V

PK - Peak detector

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

Not applicable.