



**FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8**

CERTIFICATION TEST REPORT

FOR

BLUETOOTH & DTS/UNII a/b/g/n/ac

MODEL NUMBER: GG1

FCC ID: A4R-GG1

IC: 10395A-GG1

REPORT NUMBER: 15U19985-E5

ISSUE DATE: MAY 13, 2015

Prepared for

GOOGLE INC.

**1600 AMPHITHEATRE PARKWAY
MOUNTAIN VIEW CA, 94043, U.S.A**

Prepared by

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	5/13/15	Initial Issue	F. de Anda

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: GOOGLE INC.
1600 AMPHITHEATRE PARKWAY
MOUNTAIN VIEW, CA, 94043, U.S.A

EUT DESCRIPTION: BLUETOOTH & DTS/UNII a/b/g/n/ac

MODEL: GG1

SERIAL NUMBER: HWP1A12814460057

DATE TESTED: APRIL 13 – APRIL 29, 2015

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 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
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Francisco de Anda
EMC SUPERVISOR
UL Verification Services Inc.

Tested By:



Nancy Garcia
EMC ENGINEER
UL Verification Services Inc.

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 4, and RSS-210 Issue 8.

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
<input type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D
<input type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E
<input type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F
	<input type="checkbox"/> Chamber G
	<input checked="" type="checkbox"/> 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:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
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 an accessory device that incorporates 2.4GHz, 5GHz WLAN, BT and BT-LE radio with integral antenna. The EUT is provided with an AC charger and a USB cable. When connected to a PC, the USB cable provides a path for charging and data transfer.

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	1.63	1.46
2402 - 2480	DQPSK	0.37	1.09
2402 - 2480	Enhanced 8PSK	0.82	1.21

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB antenna with a maximum gain of 4dBi for 2.4GHz band.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was V1.0.

The EUT driver software installed in the support equipment during testing was ver 6.37.32.34.1

5.5. WORST-CASE CONFIGURATION AND MODE

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

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 as provided by the client were:

GFSK mode: DH5

8PSK mode: 3-DH5

DQPSK mode has been verified to have the lowest power.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Apple	Macbook Air	C02FX0VTDJDJDK	N/A
AC Adapter	Apple	A1343	ADP-85EBT	N/A

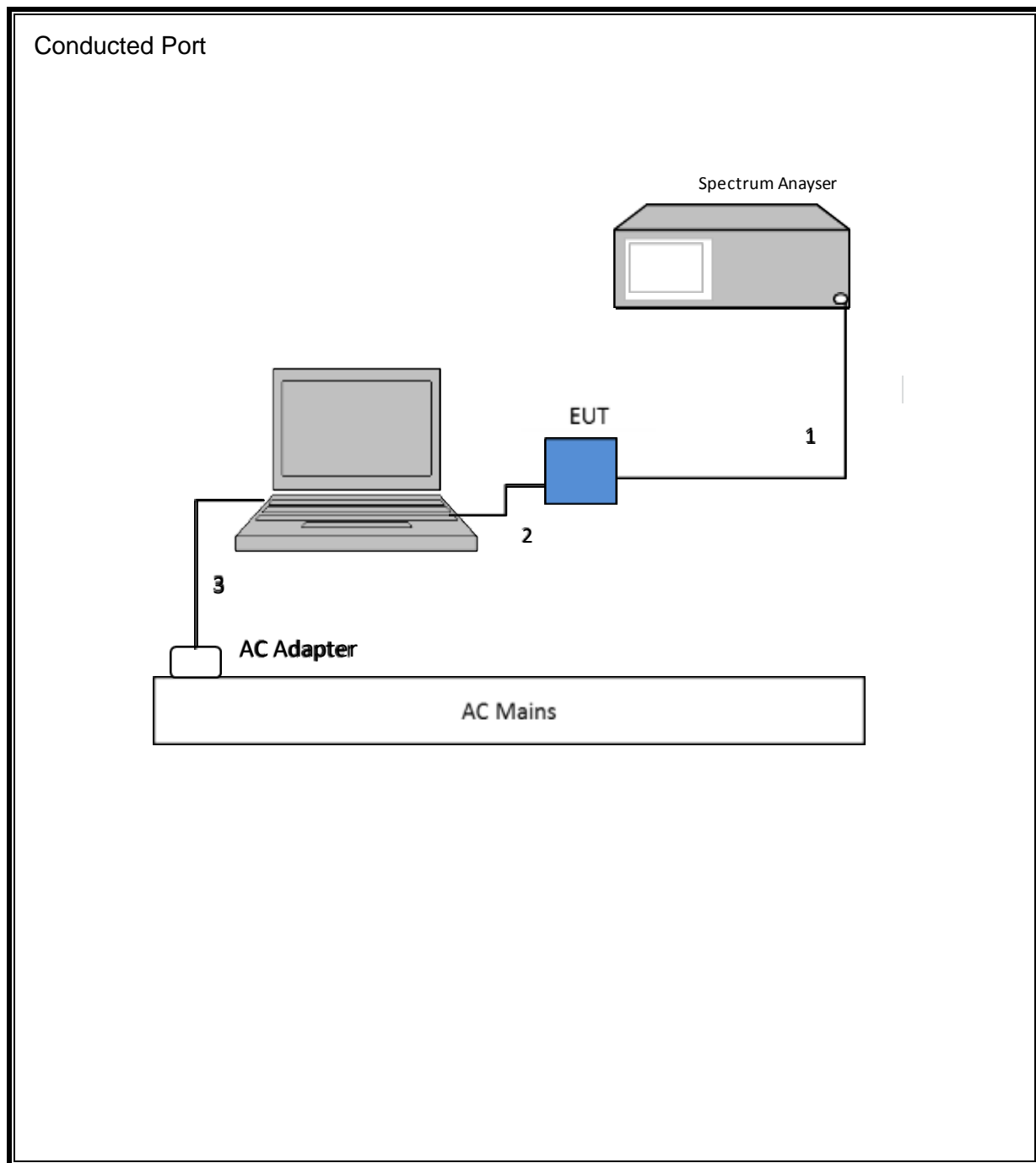
I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	Antenna	1	coax	Shielded	0.2	
2	USB	1	USB	Shielded	0.5	
3	DC	1	DC	Shielded	1.5	

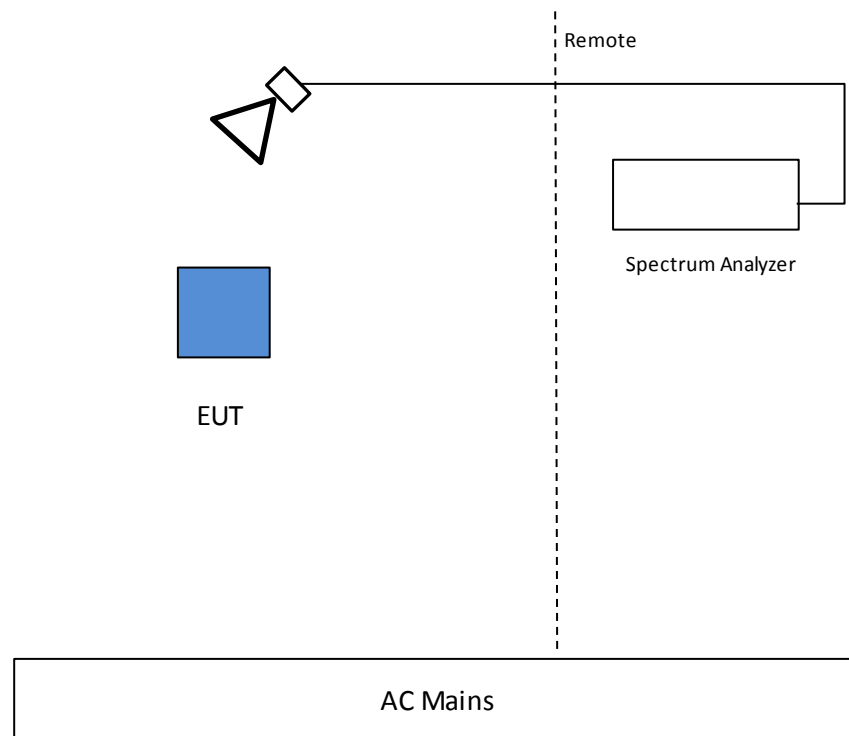
TEST SETUP

The EUT is connected to a host laptop via USB cable, test software exercises the radio.

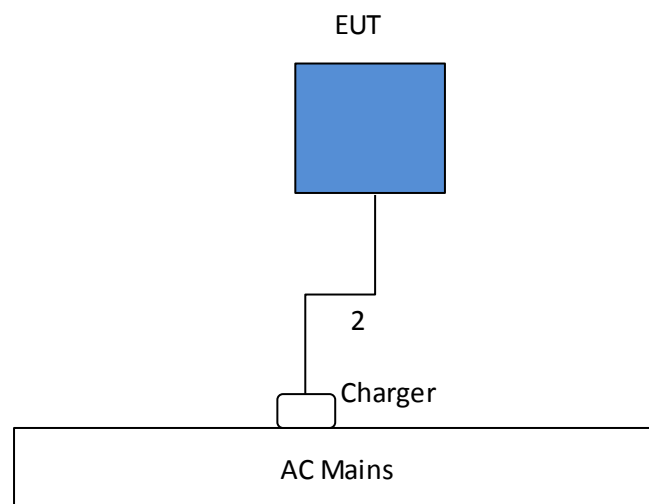
SETUP DIAGRAM FOR TESTS



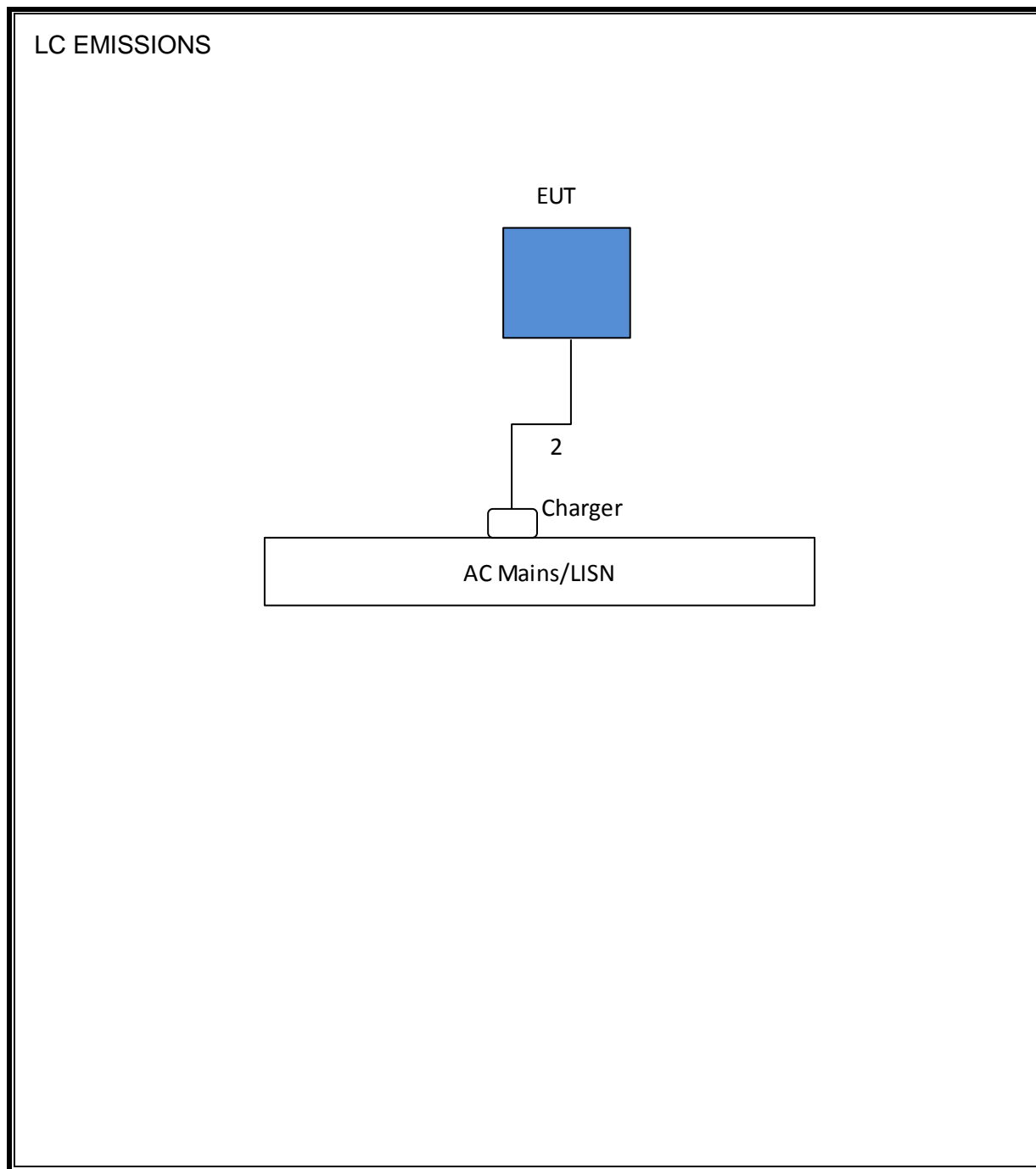
Radiated > 1GHz



Radiated <1GHz



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	T No.	Cal Date	Cal Due
Radiated Software	UL	UL EMC	Ver 9.5, July 22, 2014		
Conducted Software	UL	UL EMC	Ver 2.1.4		
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	906	05/07/14	05/07/15
Antenna, Horn 18GHz	ETS Lindgren	3117	712	01/07/15	01/07/16
Antenna, Hybrid, 30MHz to 1GHz	Sunol Sciences	JB3	900	05/14/14	05/14/15
Amplifier, 1-18GHz	Miteq	AFS42-00101800-25-S-42	495	06/05/14	06/05/15
Amplifier, 10kHz - 1GHz	Sonoma	310N	835	06/05/14	06/05/15
Spectrum Analyzer, 40GHz	HP	8564E	106	08/06/14	08/06/15
Antenna, Horn 18-26GHz	ARA	MWH-1826	89	12/17/14	12/17/15
Amplifier, 1 - 26GHz	Agilent	8449B	404	06/05/14	06/05/15
LISN, 30MHz	FCC	50/250-25-2	24	01/16/15	01/16/16
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	917	05/08/14	05/08/15

7. ANTENNA PORT TEST RESULTS

7.1. ON TIME AND DUTY CYCLE LIMITS

None; for reporting purposes only.

PROCEDURE

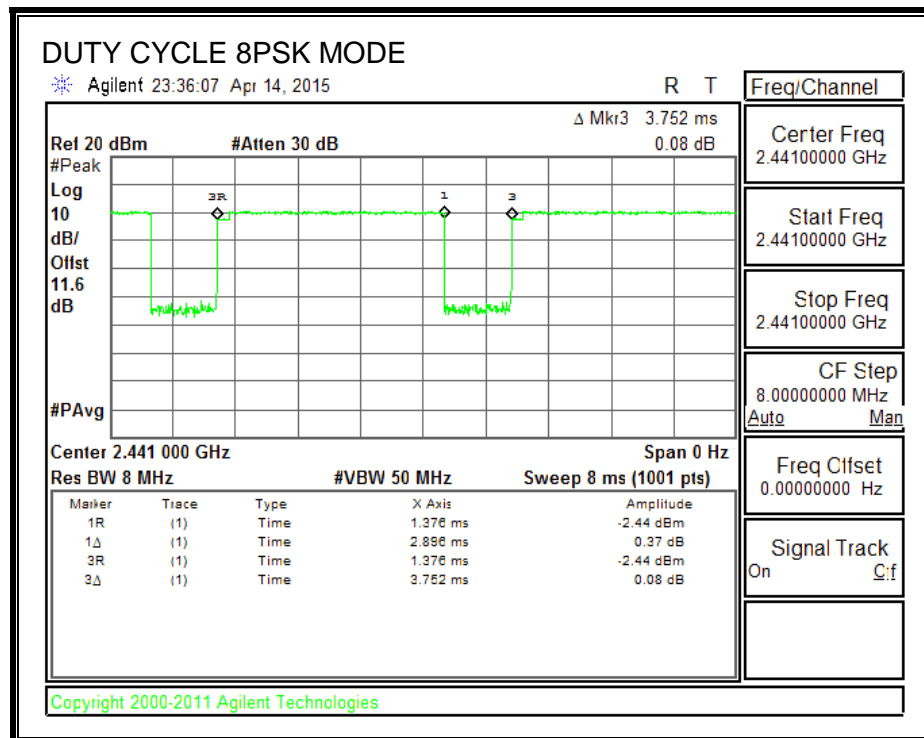
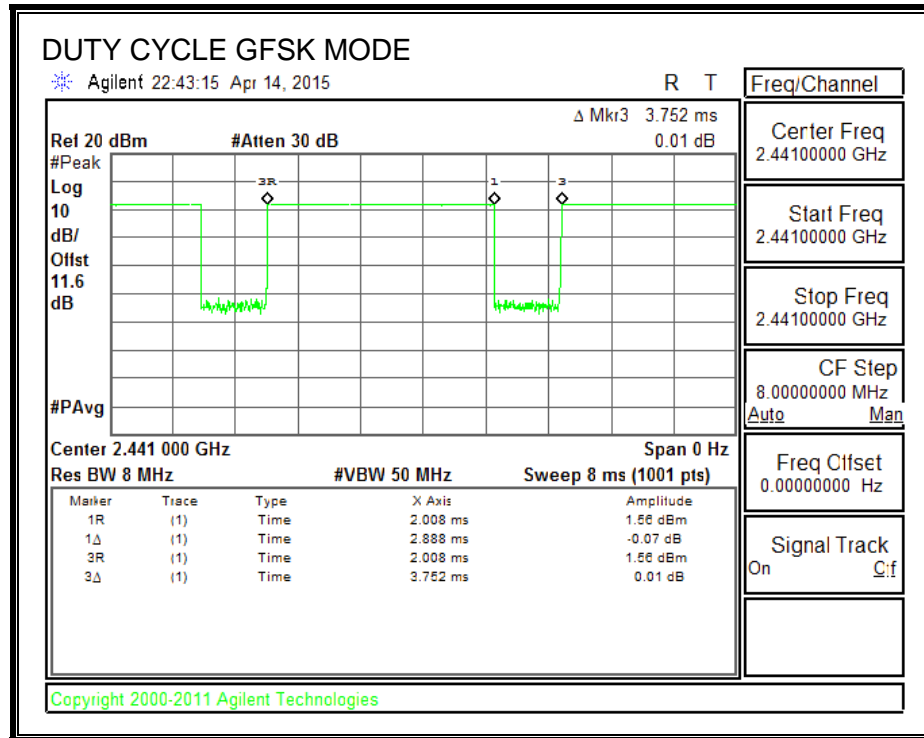
KDB 558074 Zero-Span Spectrum Analyzer Method.

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)						
Bluetooth GFSK	2.888	3.752	0.770	76.97%	1.14	0.346
Bluetooth 8PSK	2.896	3.752	0.772	77.19%	1.12	0.345

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.

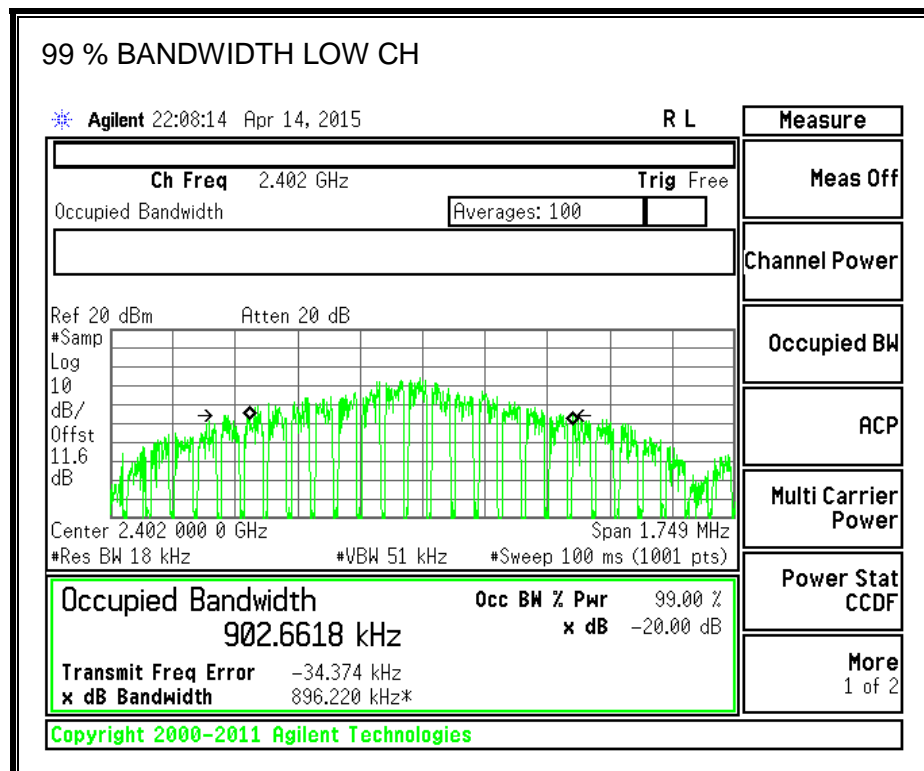
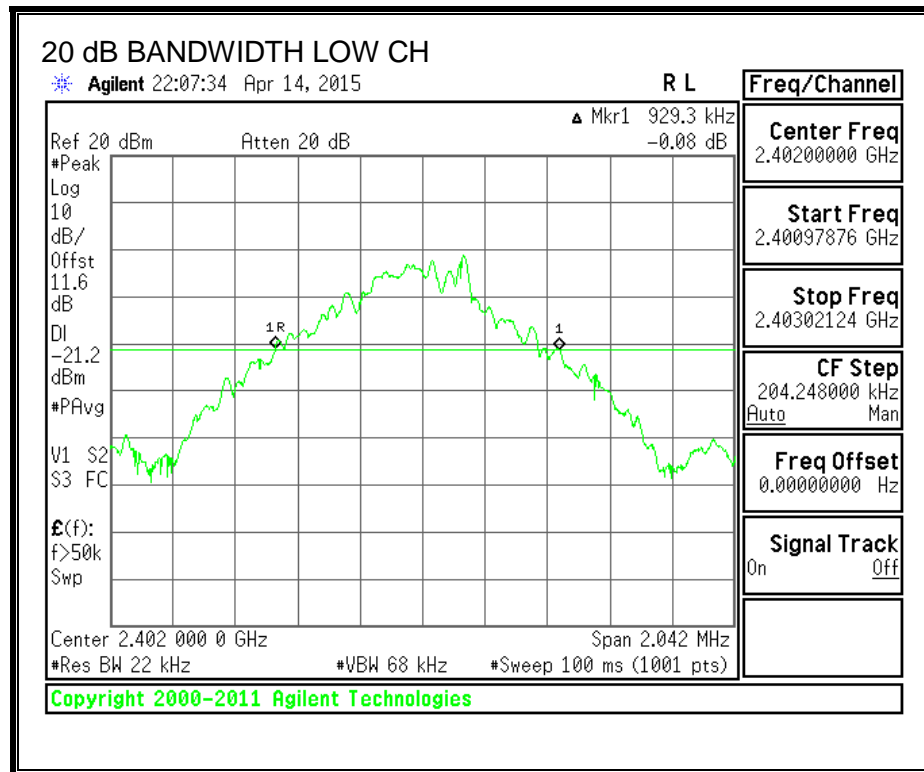
TEST PROCEDURE

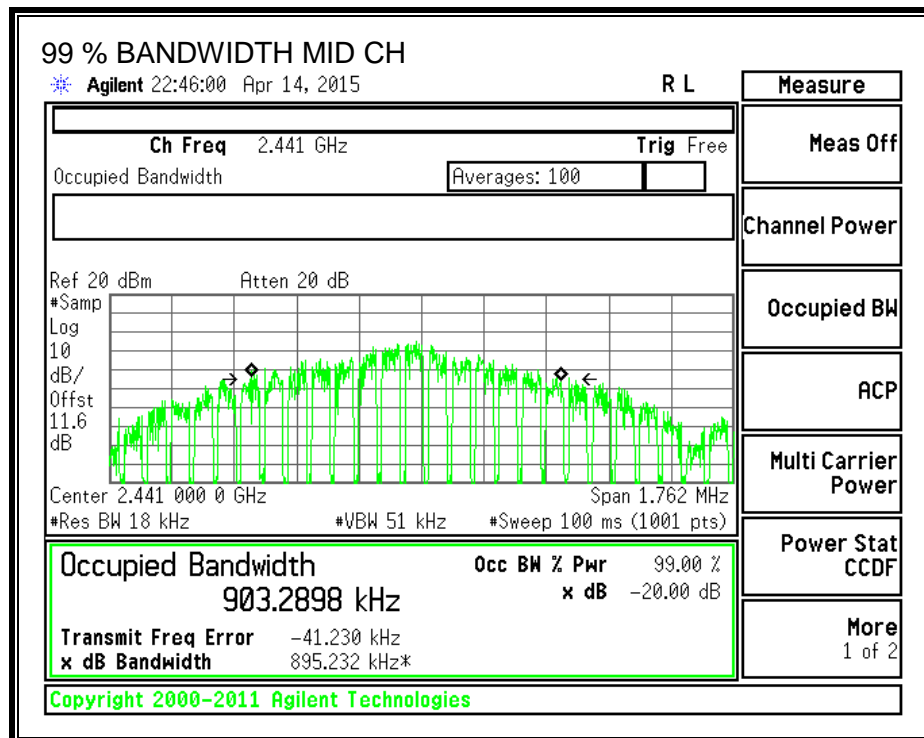
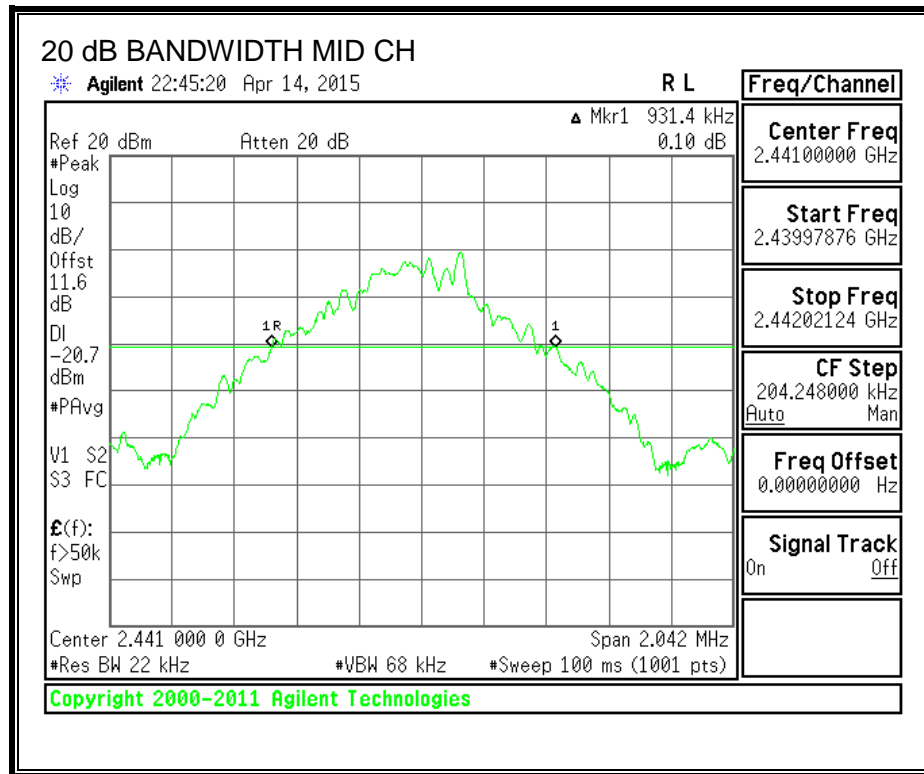
The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

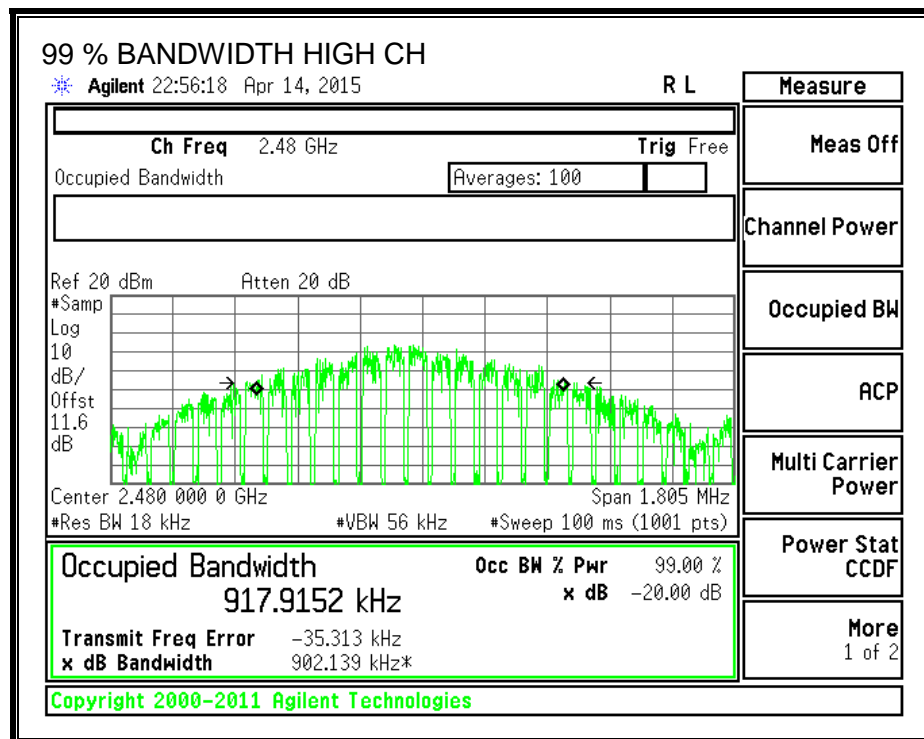
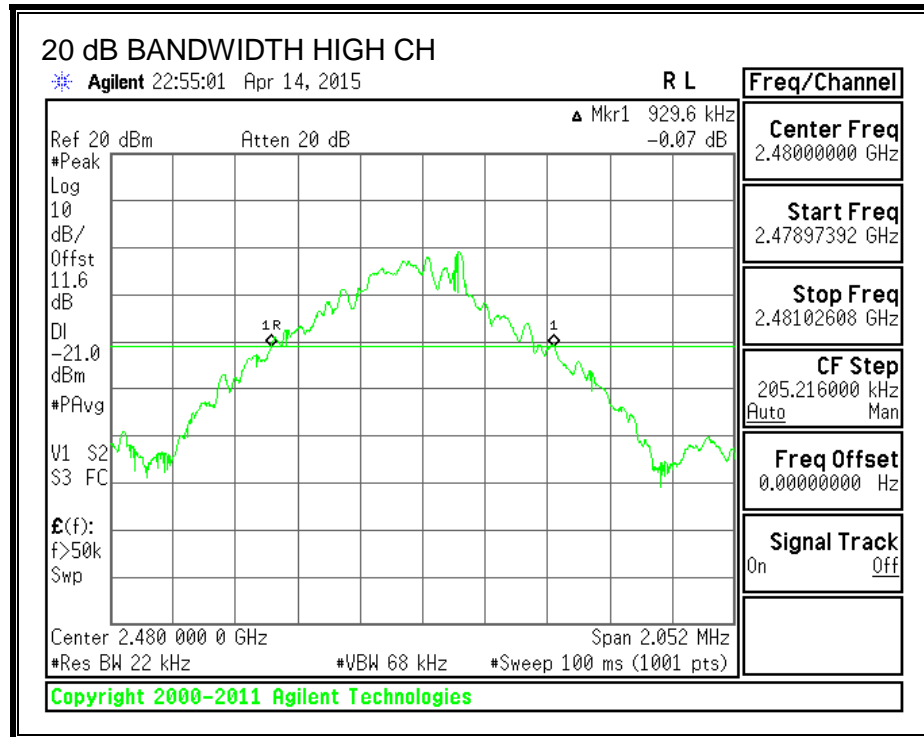
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	929.3	902.6618
Middle	2441	931.4	903.2898
High	2480	929.6	917.9152

20 dB AND 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 hopping channel, whichever is greater.

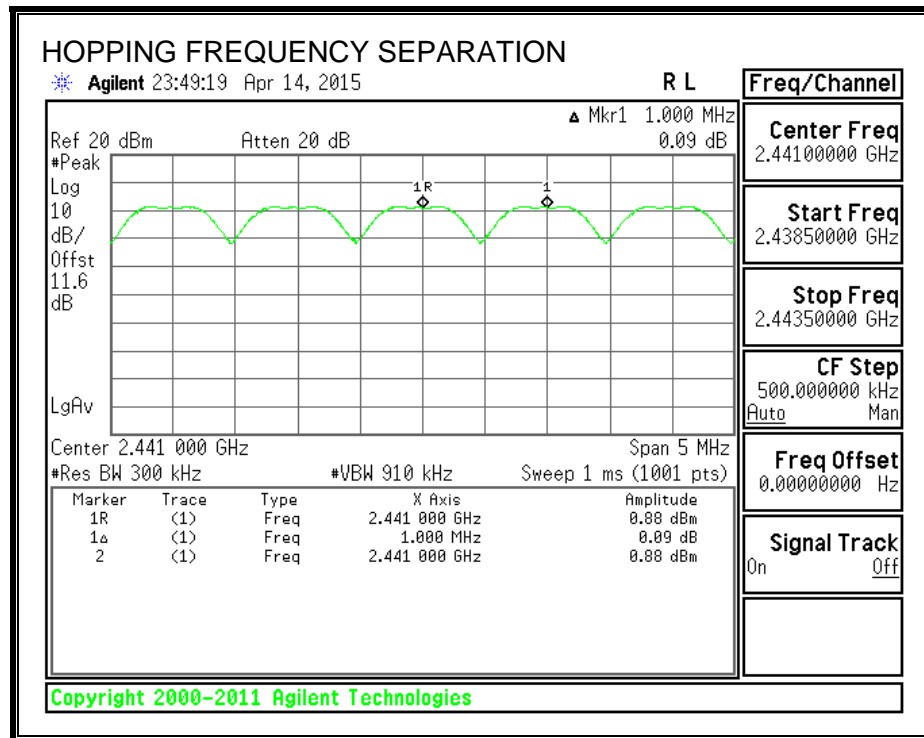
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION



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.

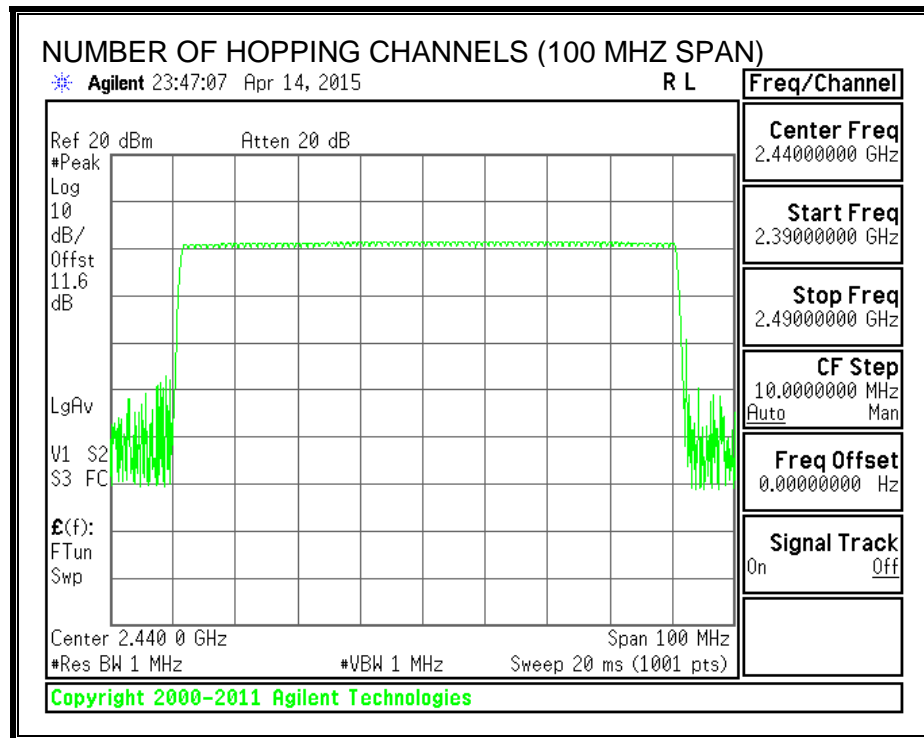
TEST PROCEDURE

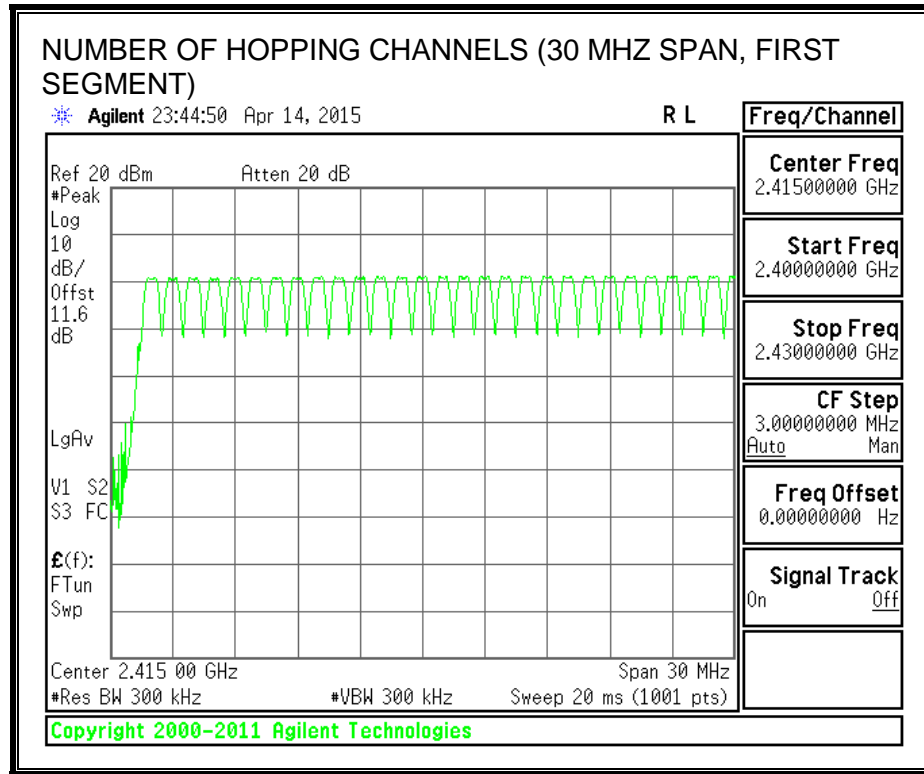
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

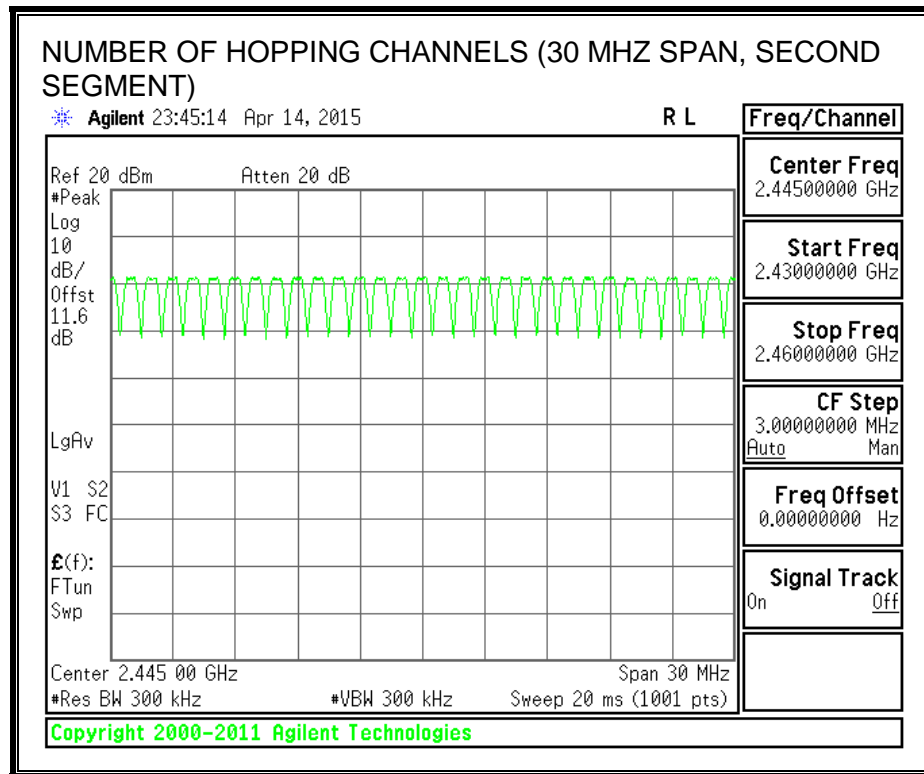
RESULTS

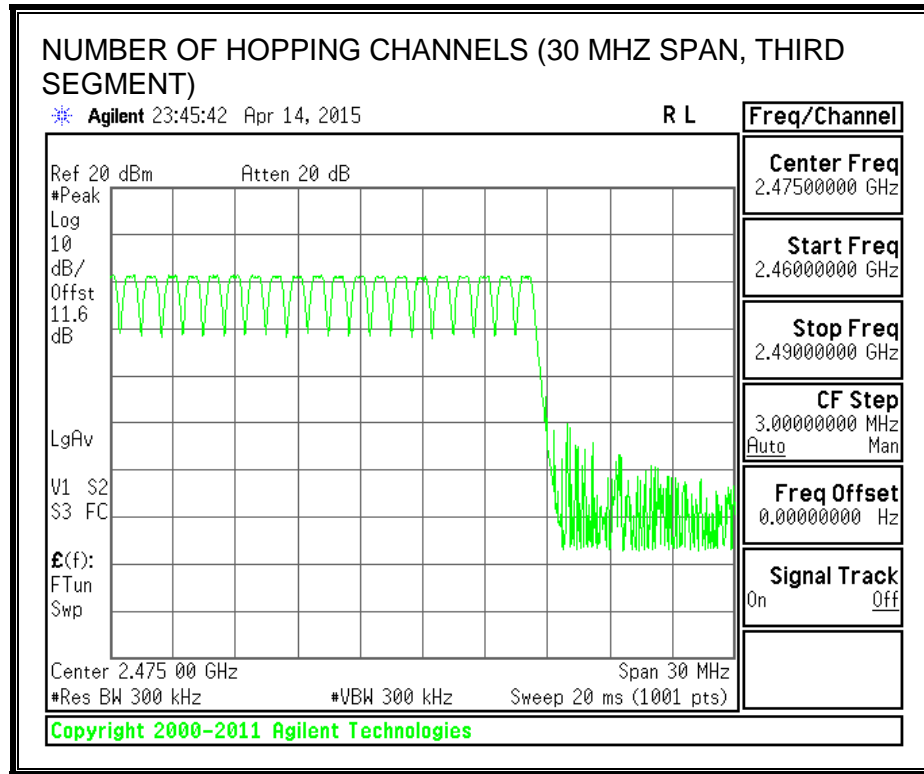
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS









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 $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

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

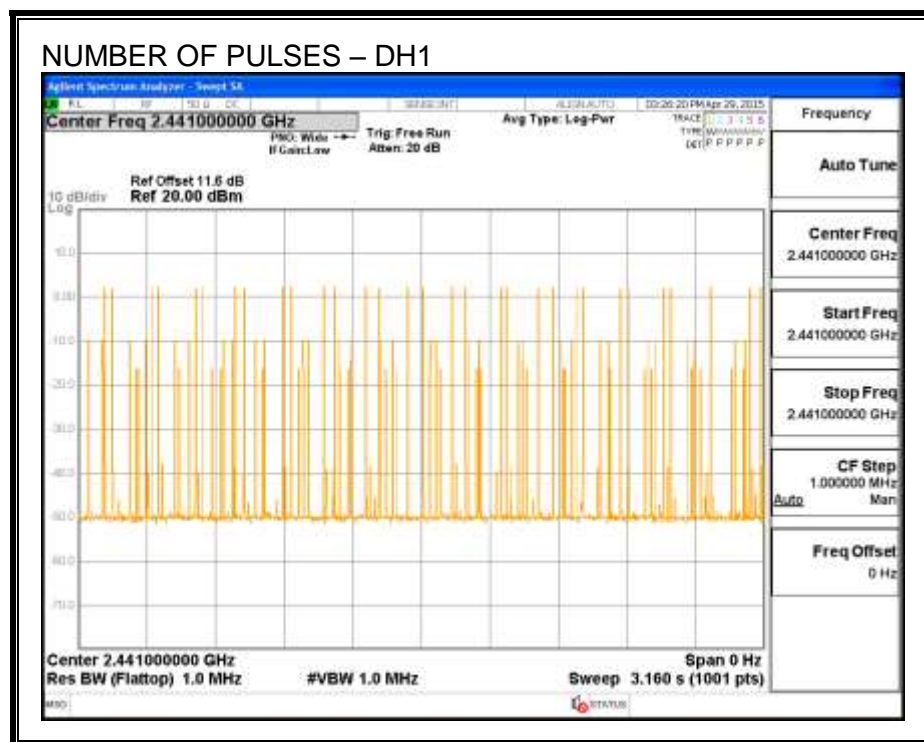
RESULTS

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	0.386	32	0.124	0.4	-0.276
DH3	1.642	15	0.246	0.4	-0.154
DH5	2.992	11	0.329	0.4	-0.071
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	0.386	8	0.031	0.4	-0.369
DH3	1.642	3.75	0.062	0.4	-0.338
DH5	2.992	2.75	0.082	0.4	-0.318

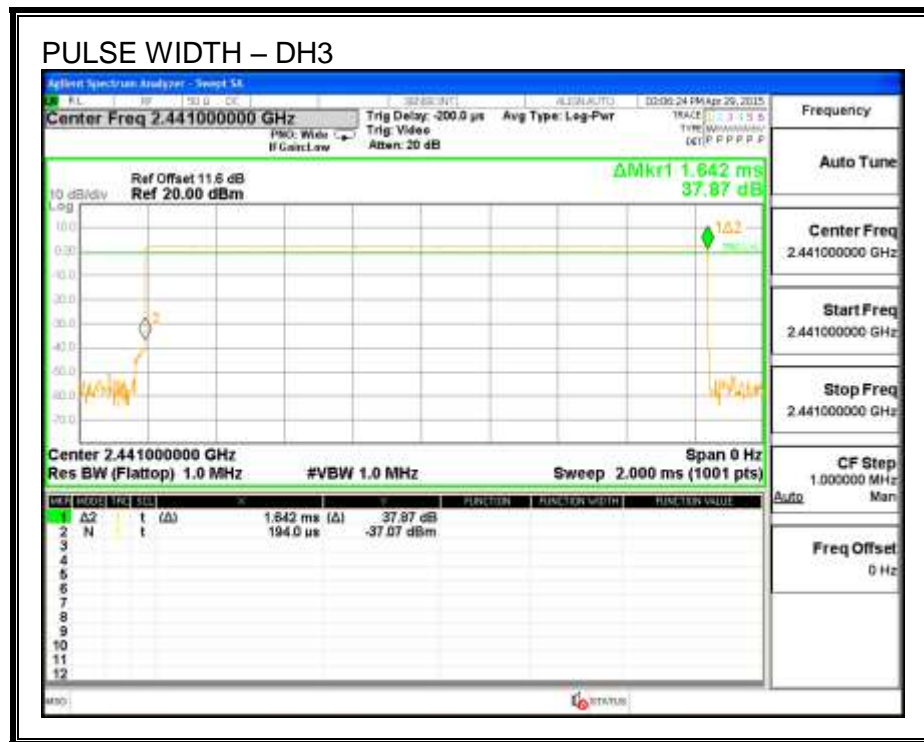
PULSE WIDTH - DH1



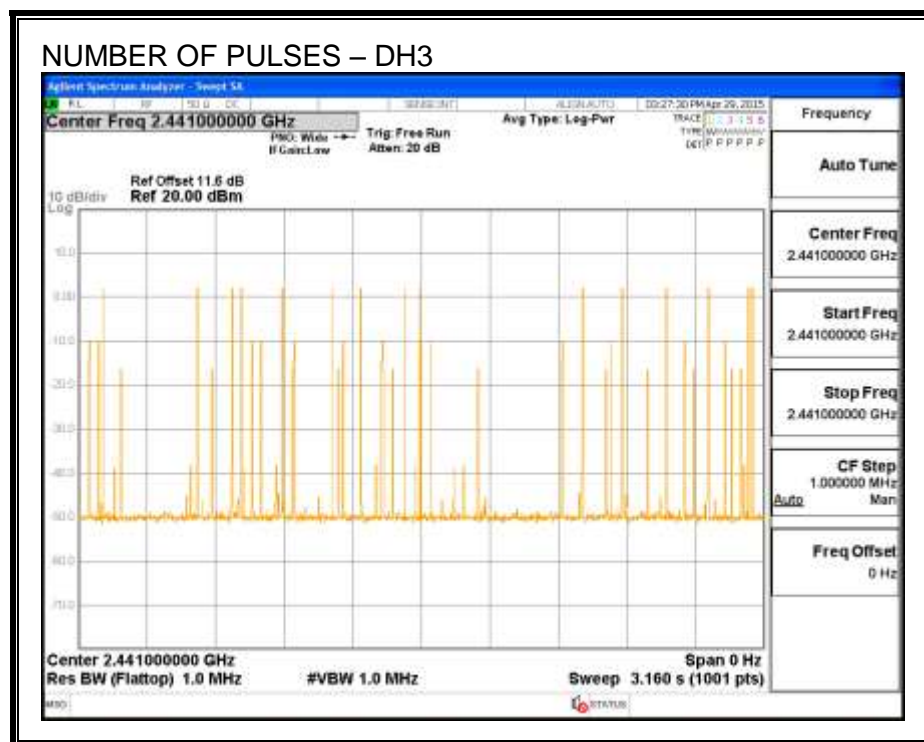
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



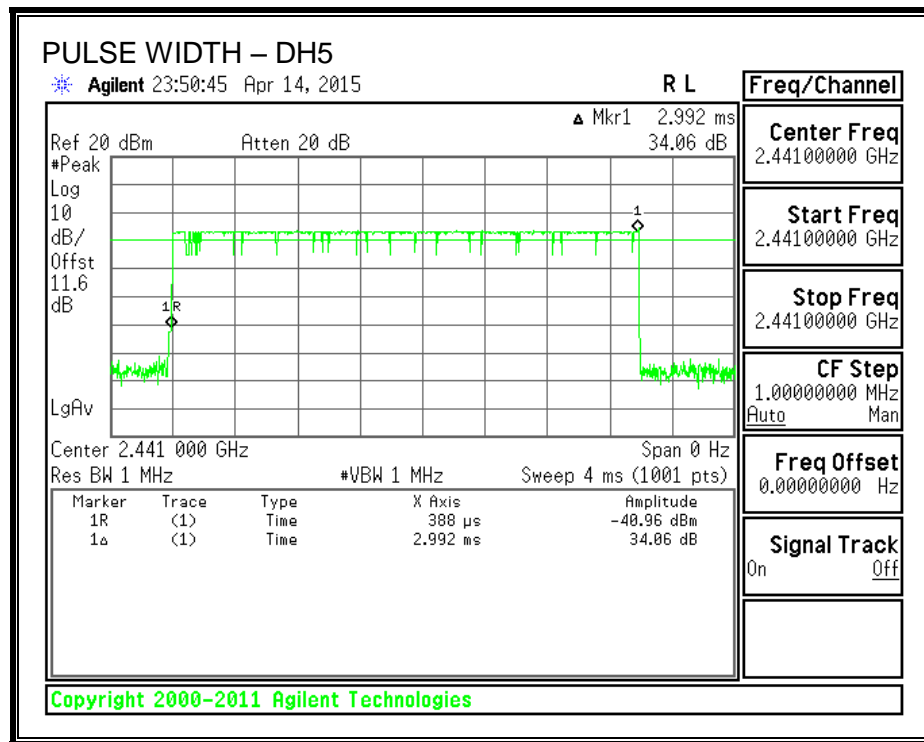
PULSE WIDTH – DH3



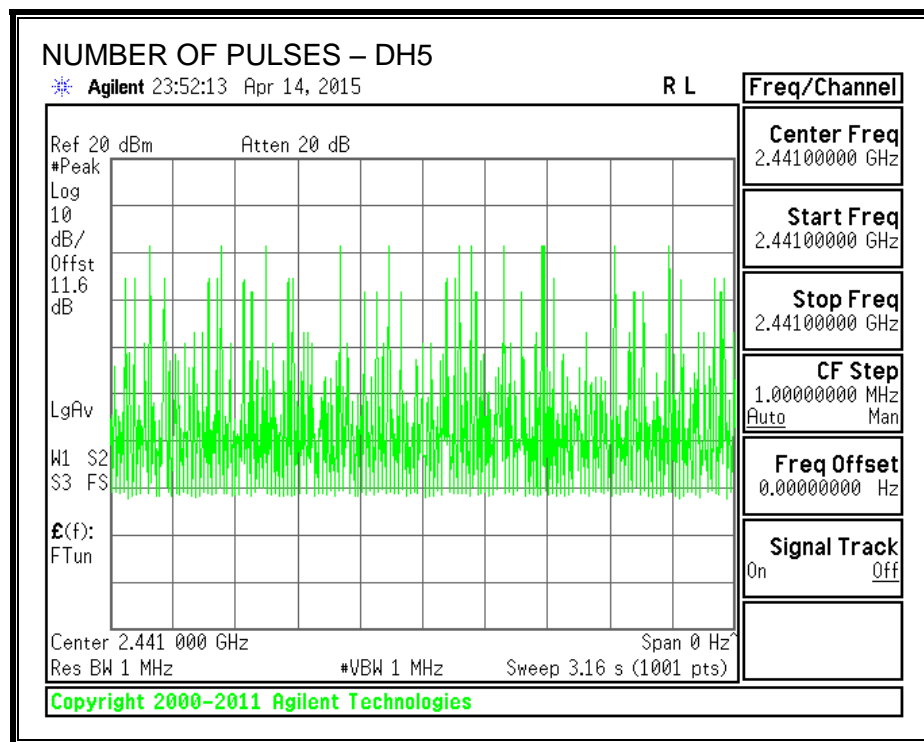
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.2.5. 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-210 Clause A8.4 (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.

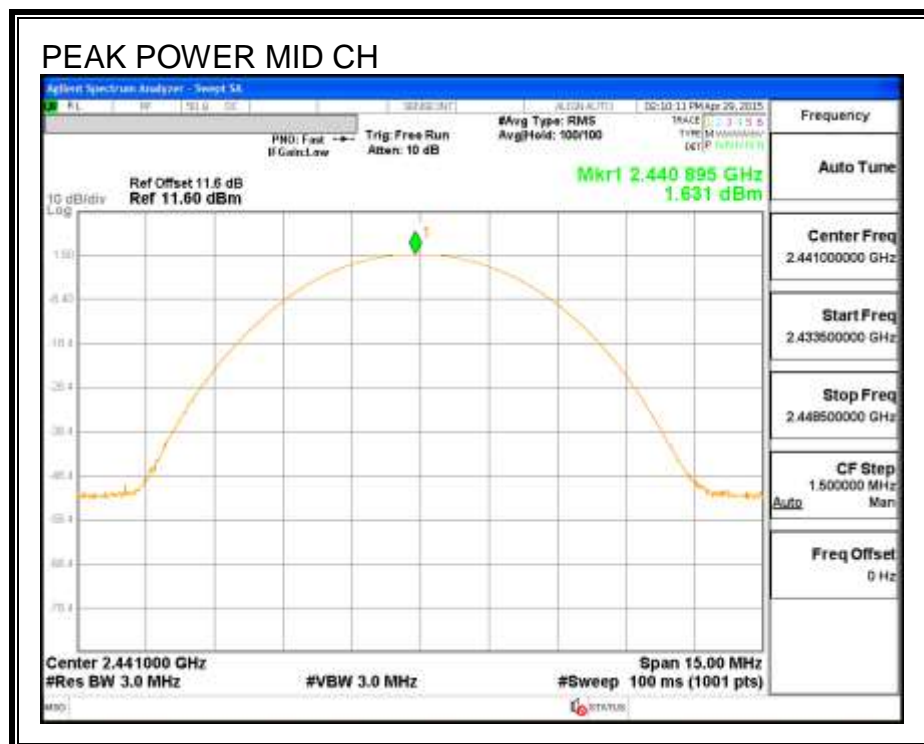
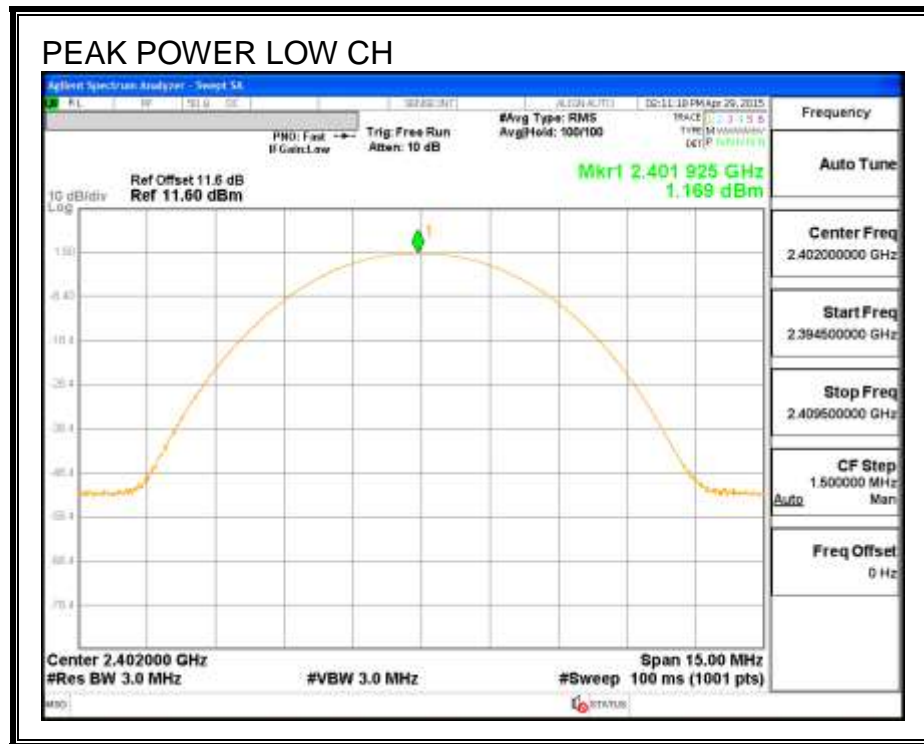
TEST PROCEDURE

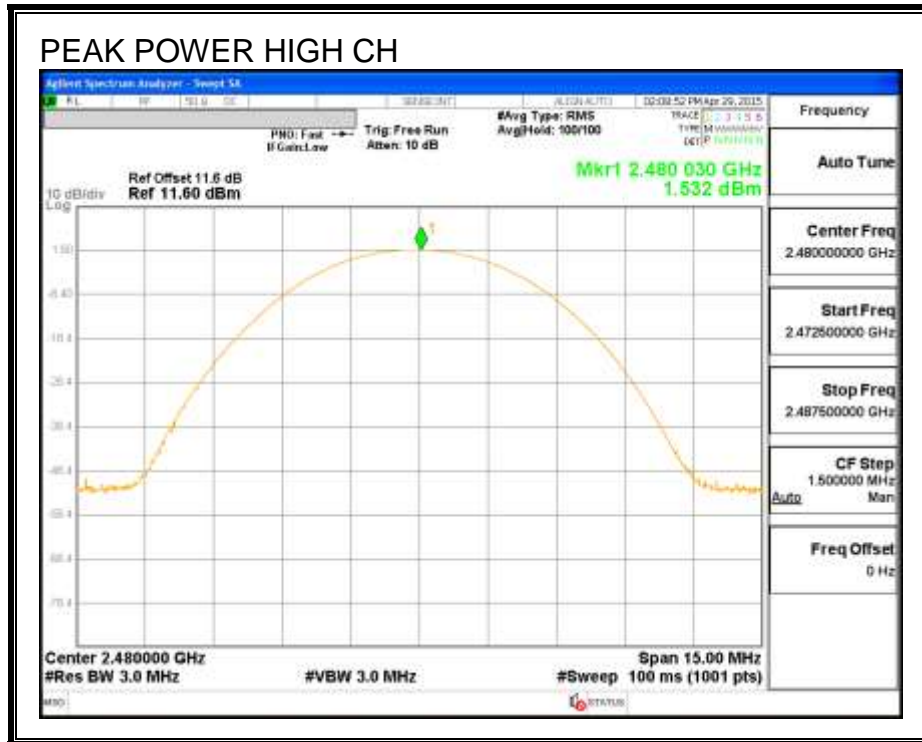
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	1.17	4.00	21	-19.83
Middle	2441	1.63	4.00	21	-19.37
High	2480	1.53	4.00	21	-19.47

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 10.5 dB (including 10 dB pad and 0.5 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	-0.12
Middle	2441	0.30
High	2480	0.05

7.2.7. 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-210 A8.5

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

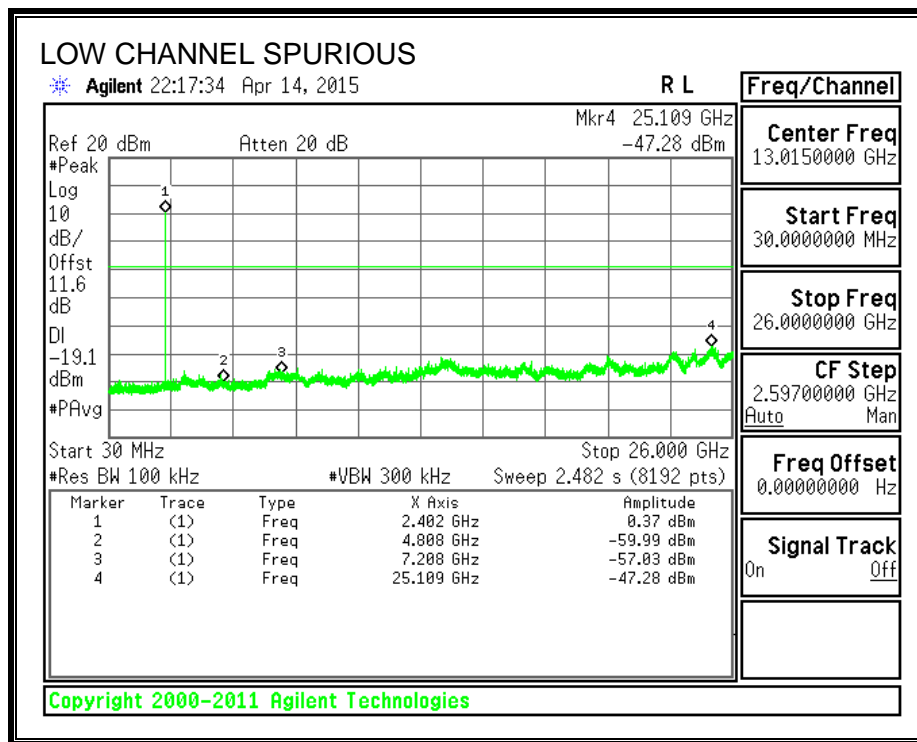
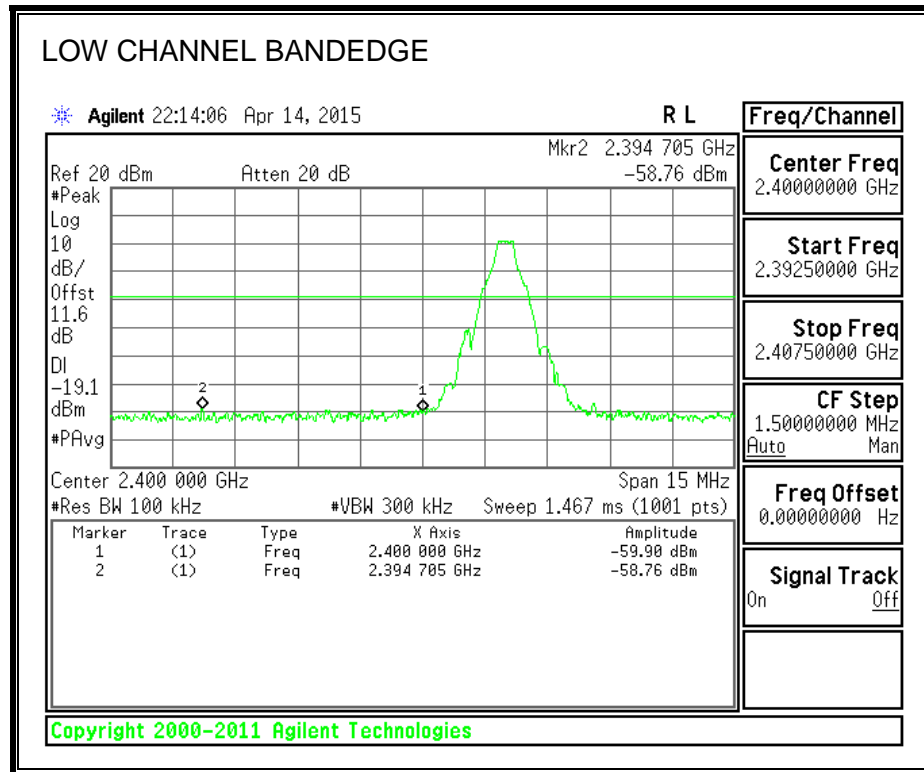
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

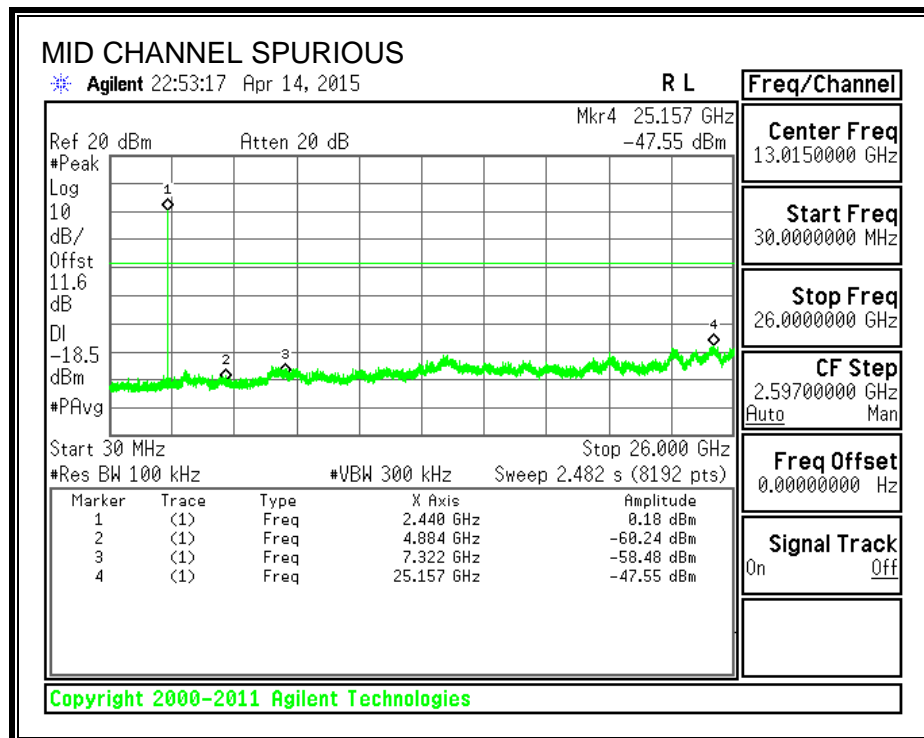
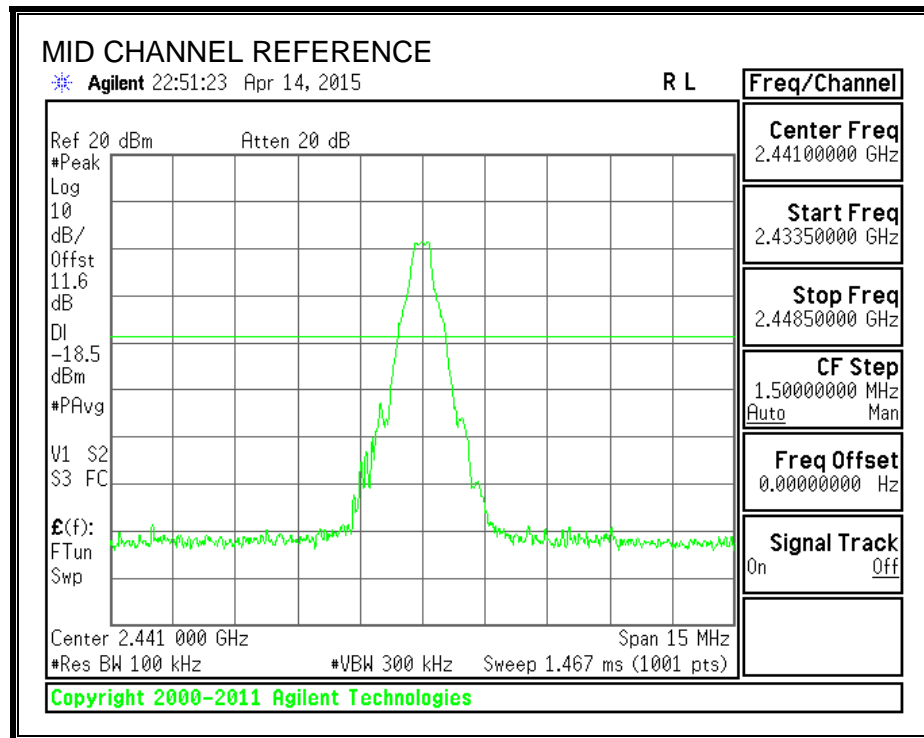
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

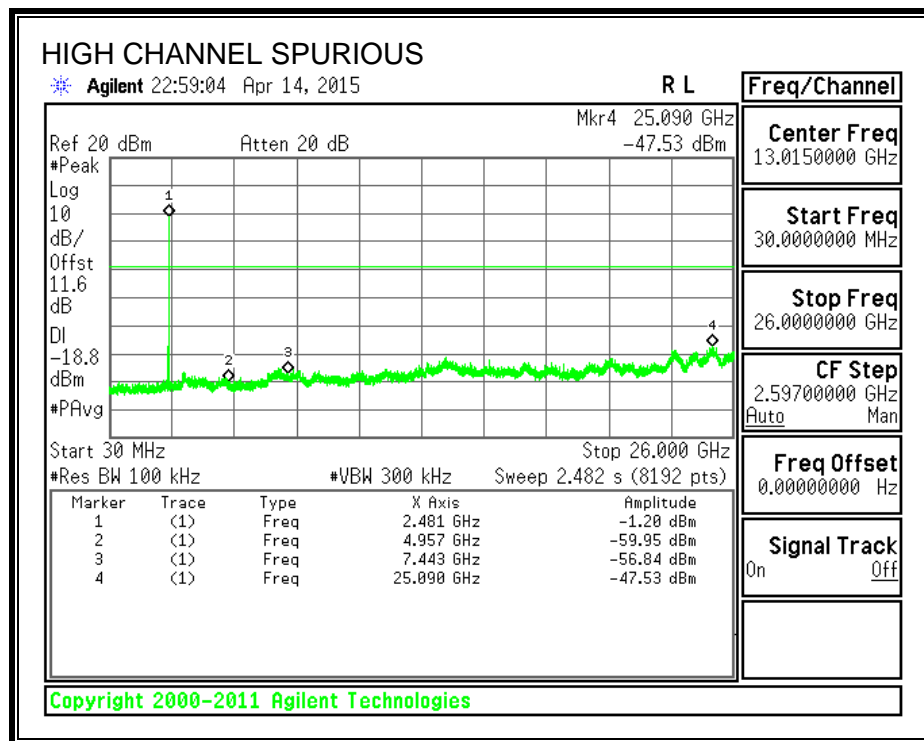
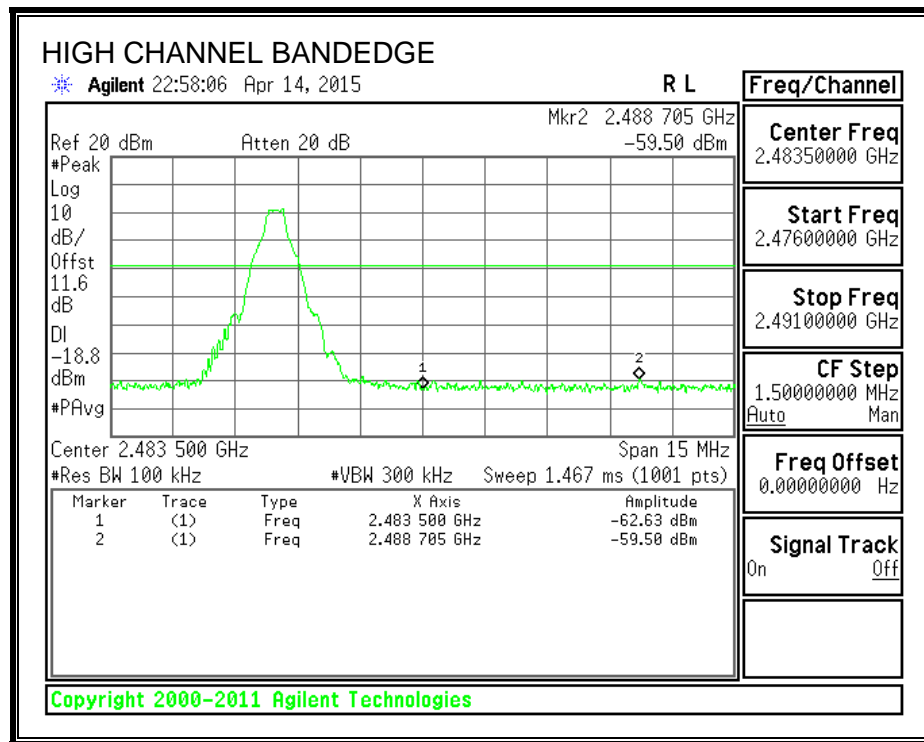
SPURIOUS EMISSIONS, LOW CHANNEL



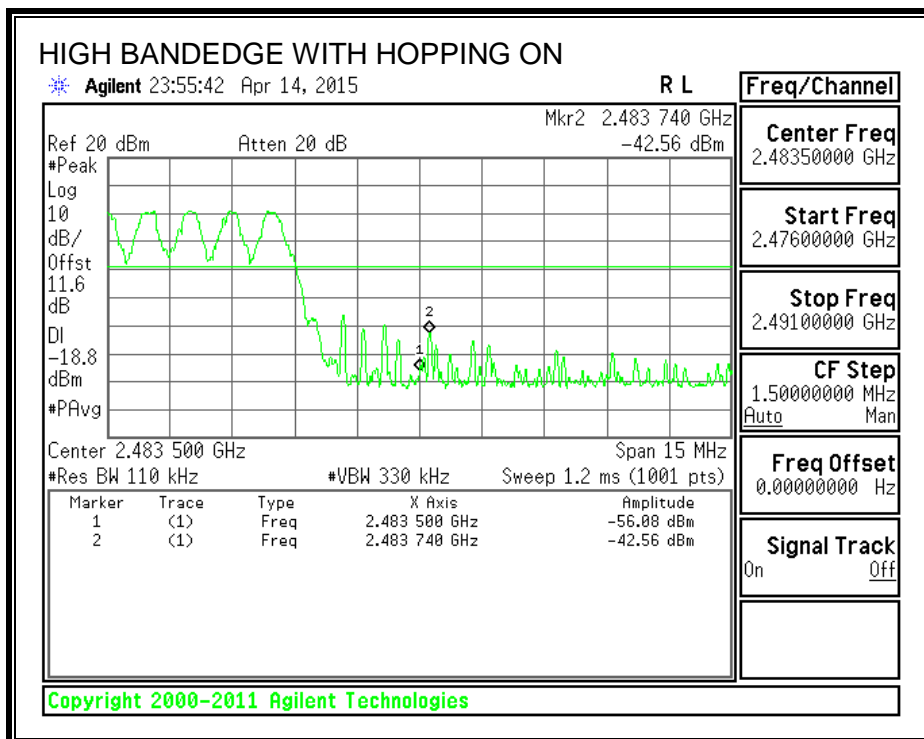
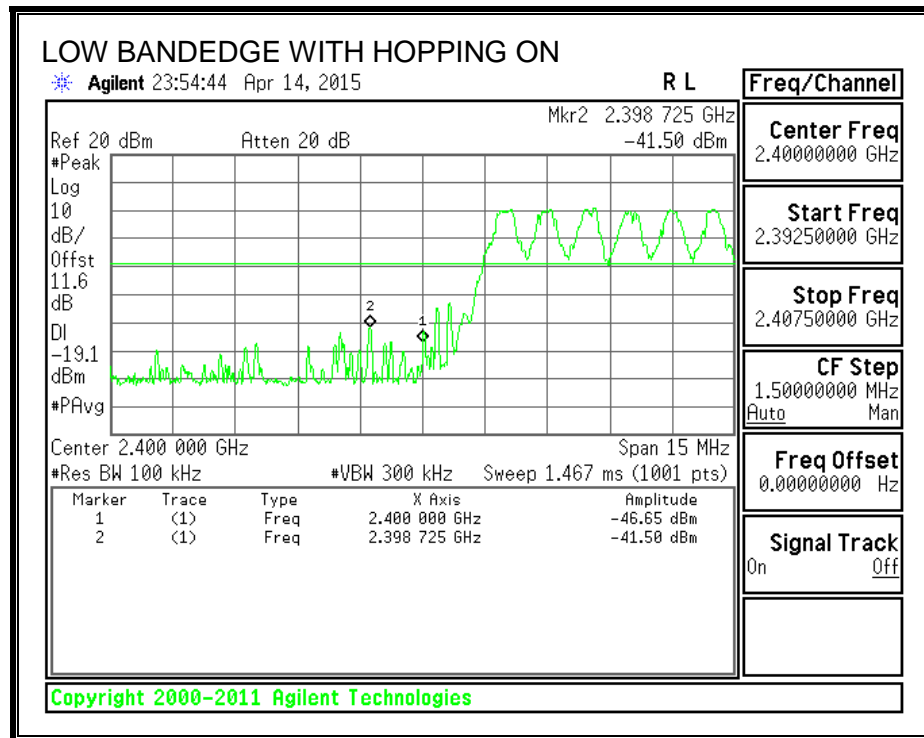
SPURIOUS EMISSIONS, MID CHANNEL



SPURIOUS EMISSIONS, HIGH CHANNEL



SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



7.1. ENHANCED DATA RATE QPSK MODULATION

7.1.1. 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-210 Clause A8.4 (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.

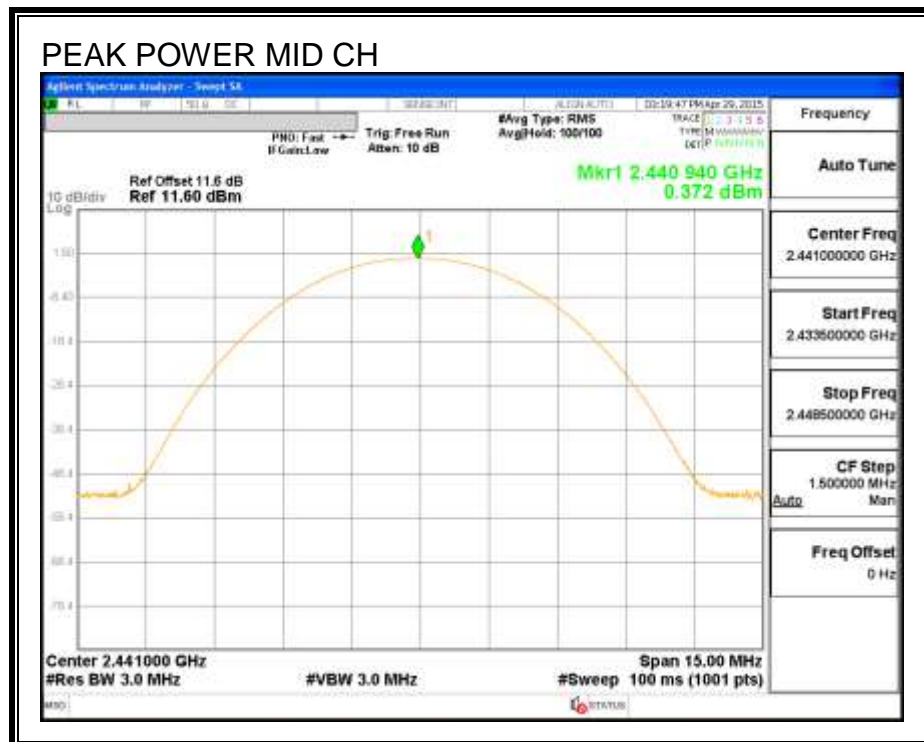
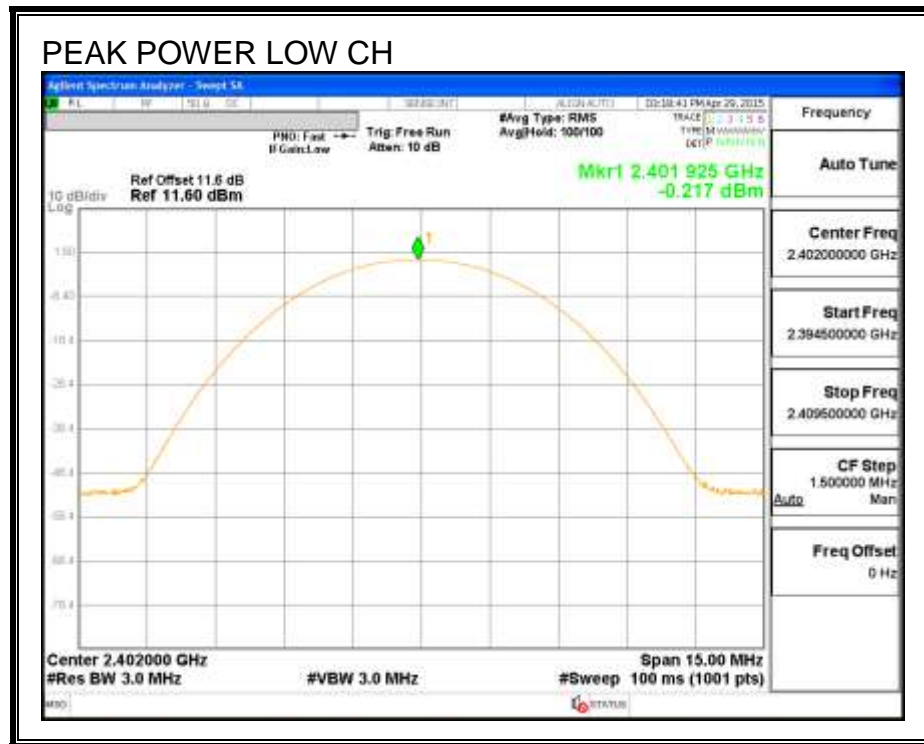
TEST PROCEDURE

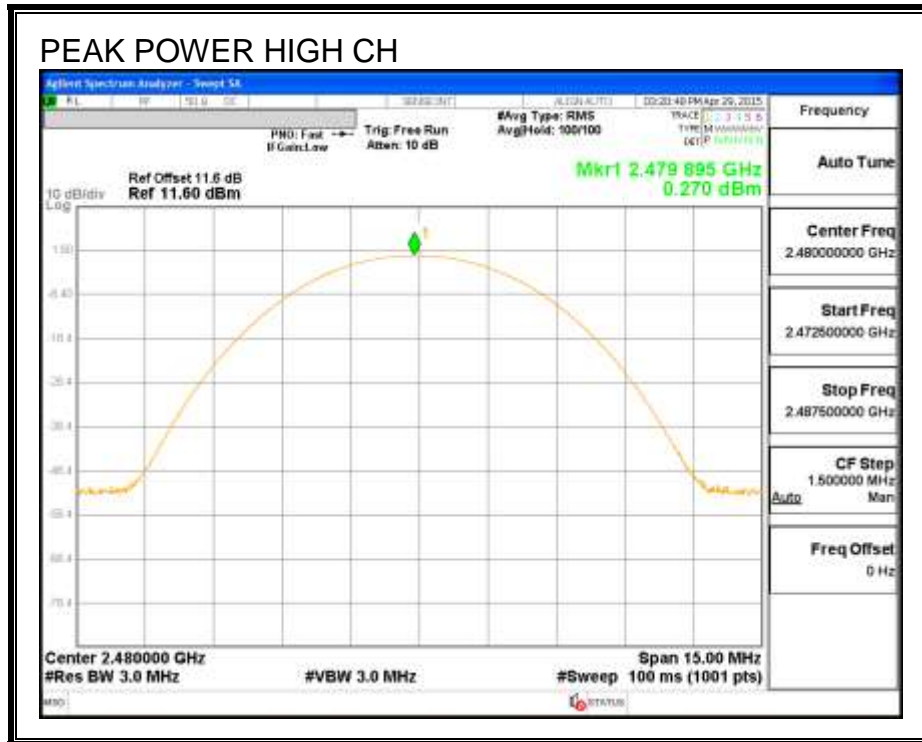
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	-0.22	4.00	21	-21.22
Middle	2441	0.37	4.00	21	-20.63
High	2480	0.27	4.00	21	-20.73

OUTPUT POWER





7.1.2. 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 10.5 dB (including 10 dB pad and 0.5 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	-3.98
Middle	2441	-3.54
High	2480	-3.80

7.2. ENHANCED DATA RATE 8PSK MODULATION

7.2.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

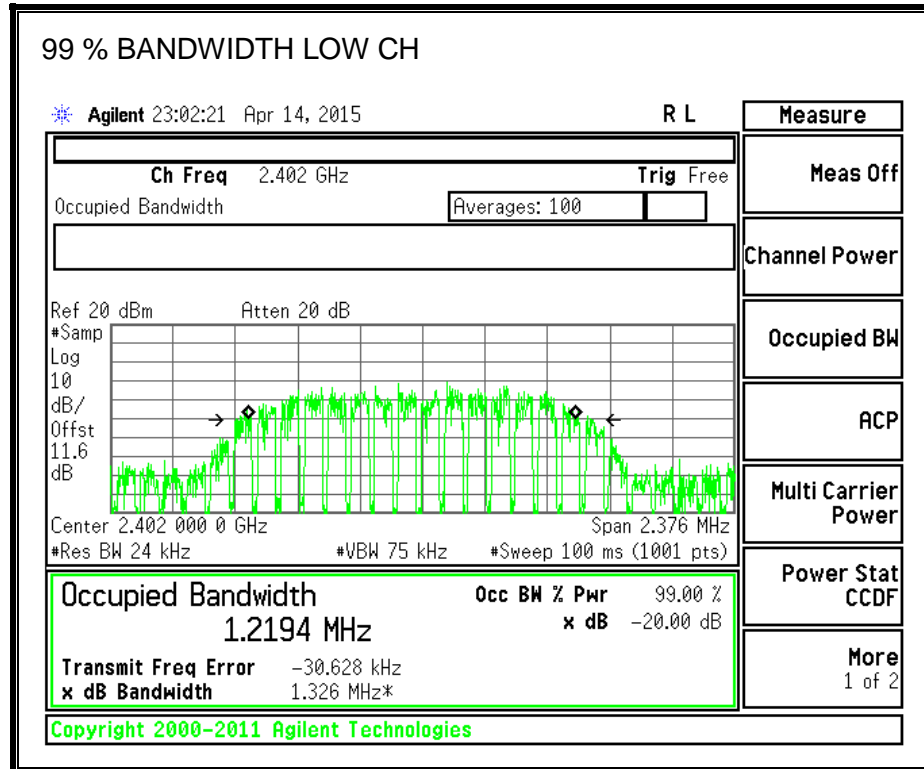
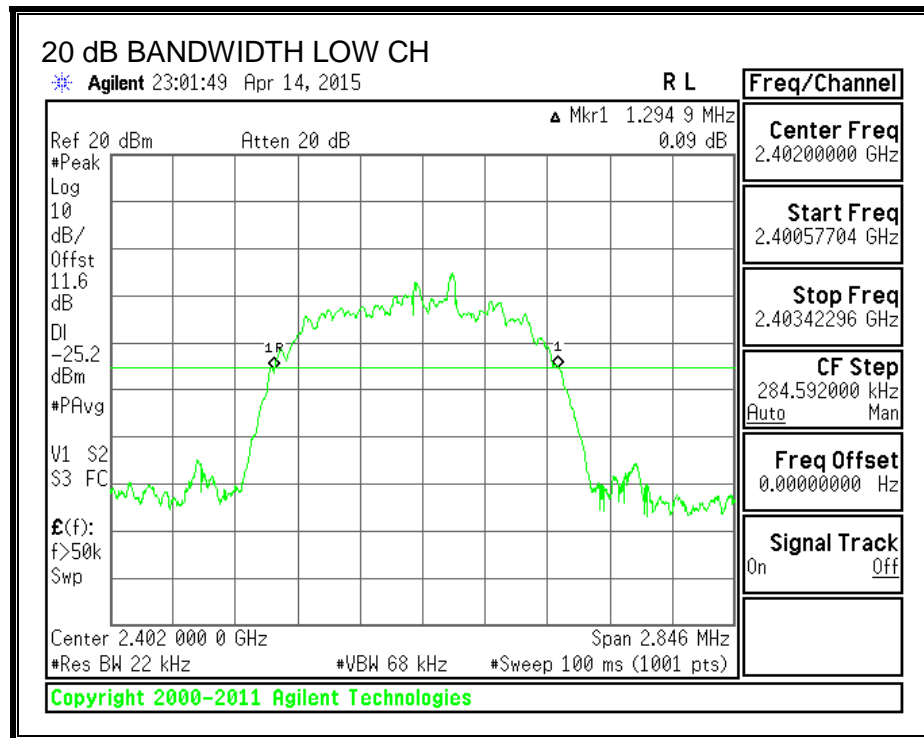
TEST PROCEDURE

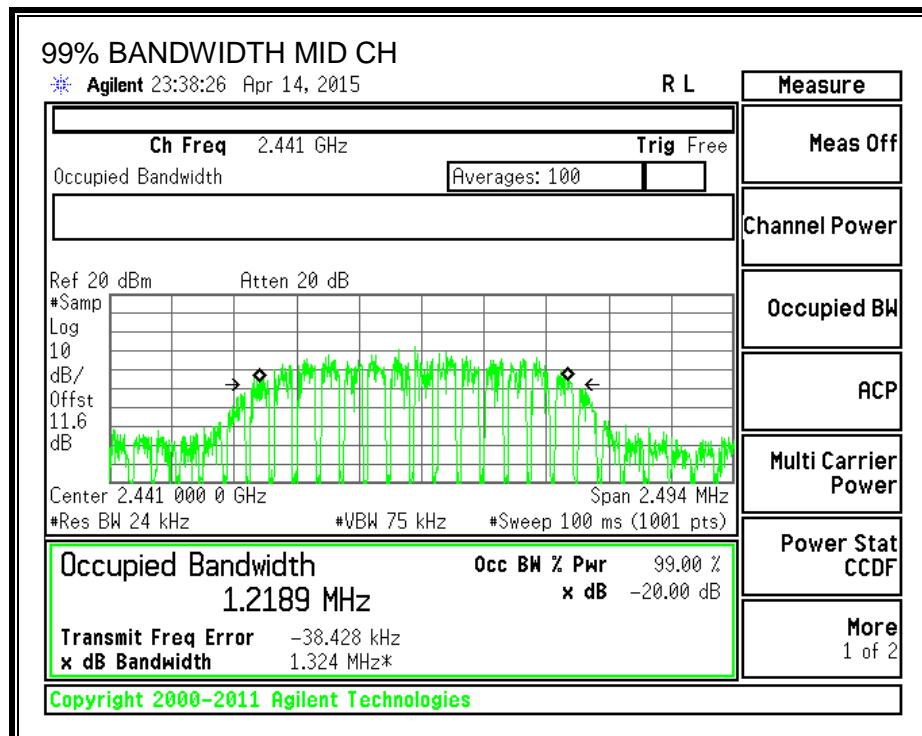
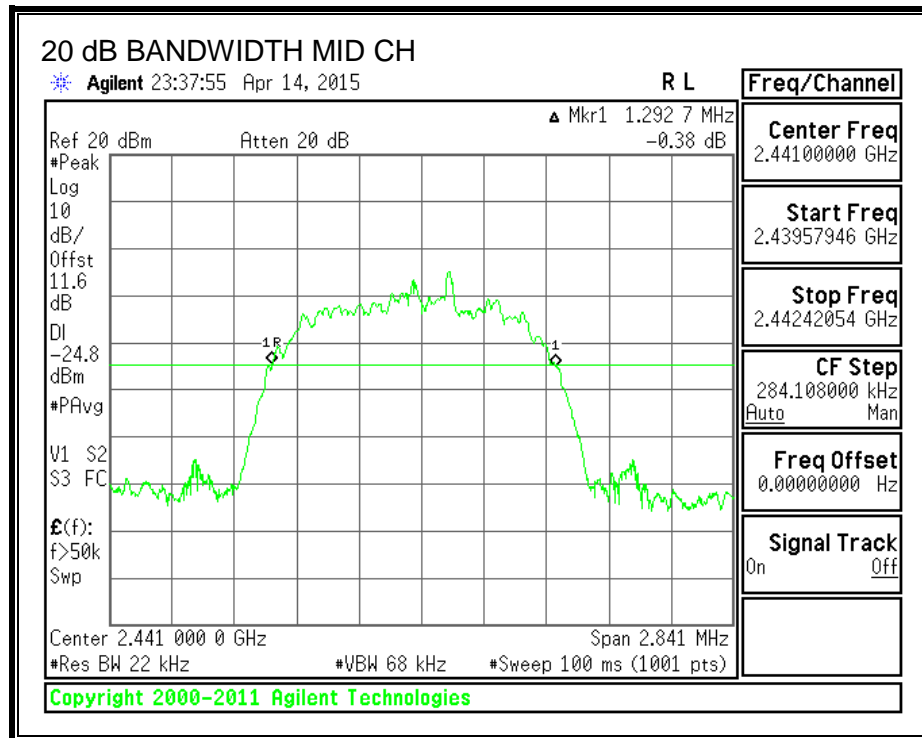
The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

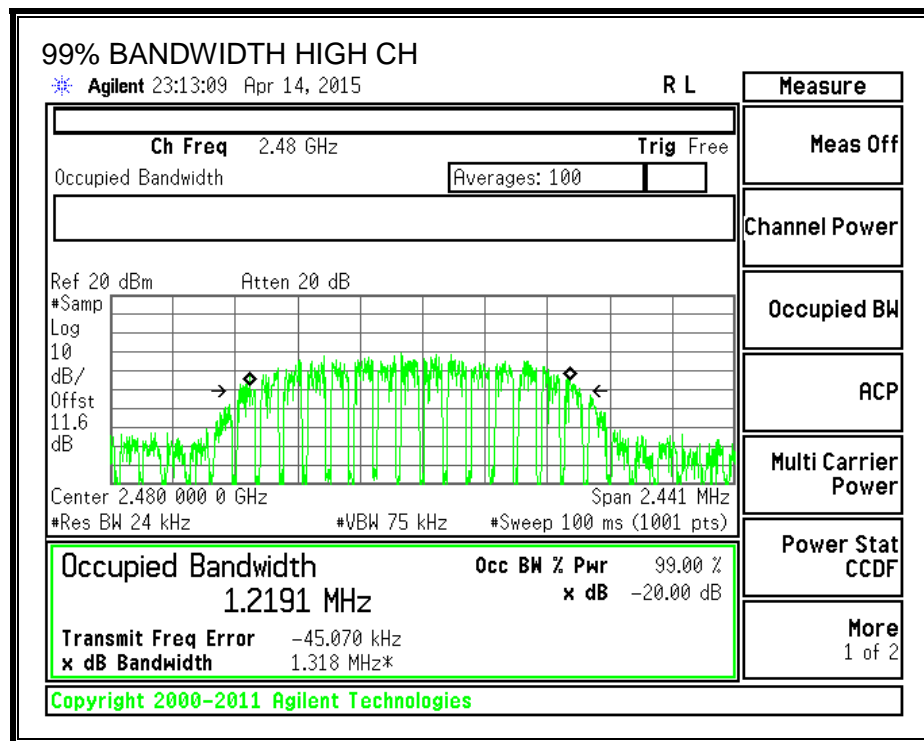
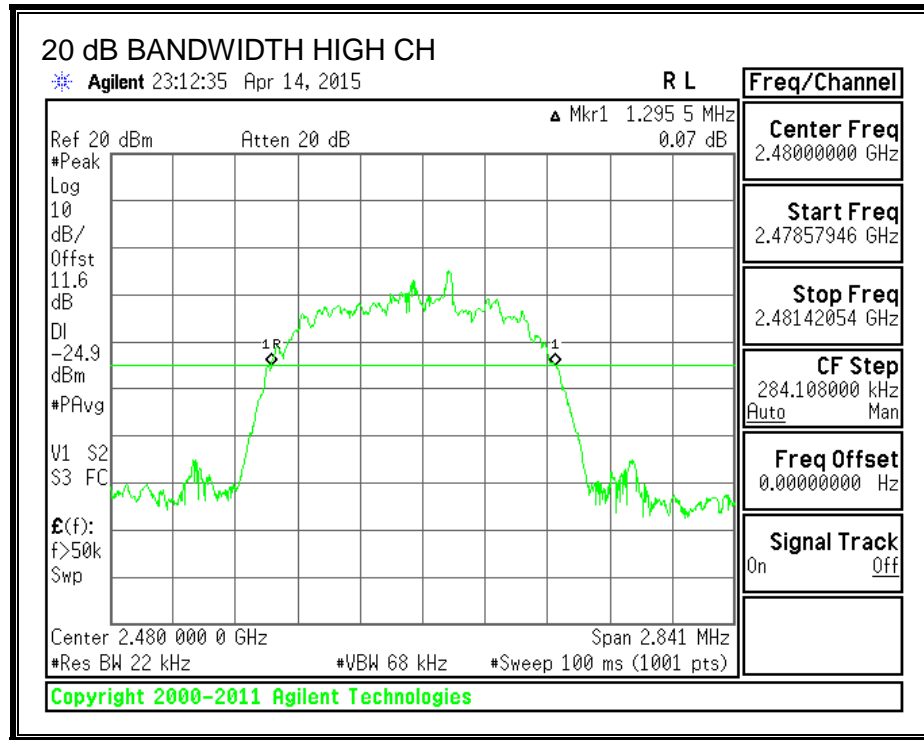
RESULTS

Channel	Frequency (MHz)	20 dB Bandwidth (kHz)	99% Bandwidth (kHz)
Low	2402	0.0012949	0.0012194
Middle	2441	0.0012927	0.0012189
High	2480	0.0012955	0.0012191

20 dB AND 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 hopping channel, whichever is greater.

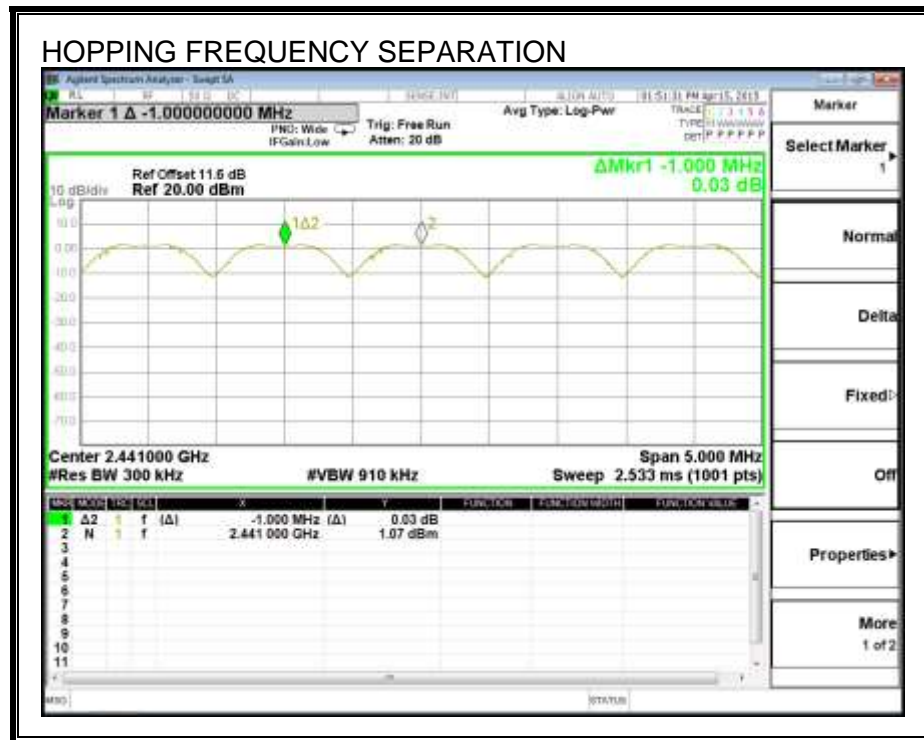
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

RESULTS

HOPPING FREQUENCY SEPARATION



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.

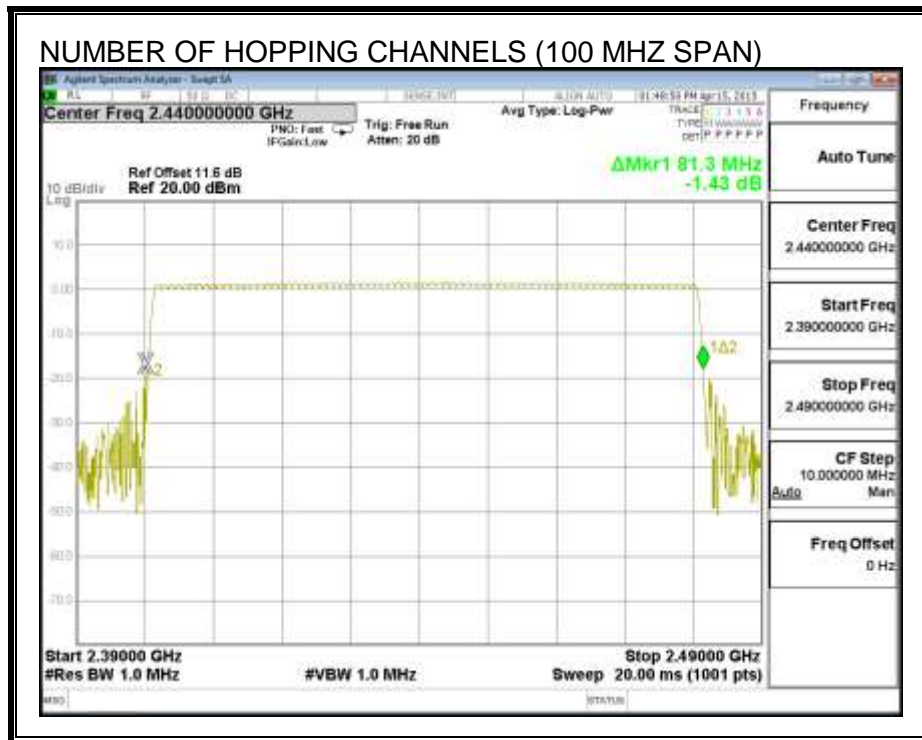
TEST PROCEDURE

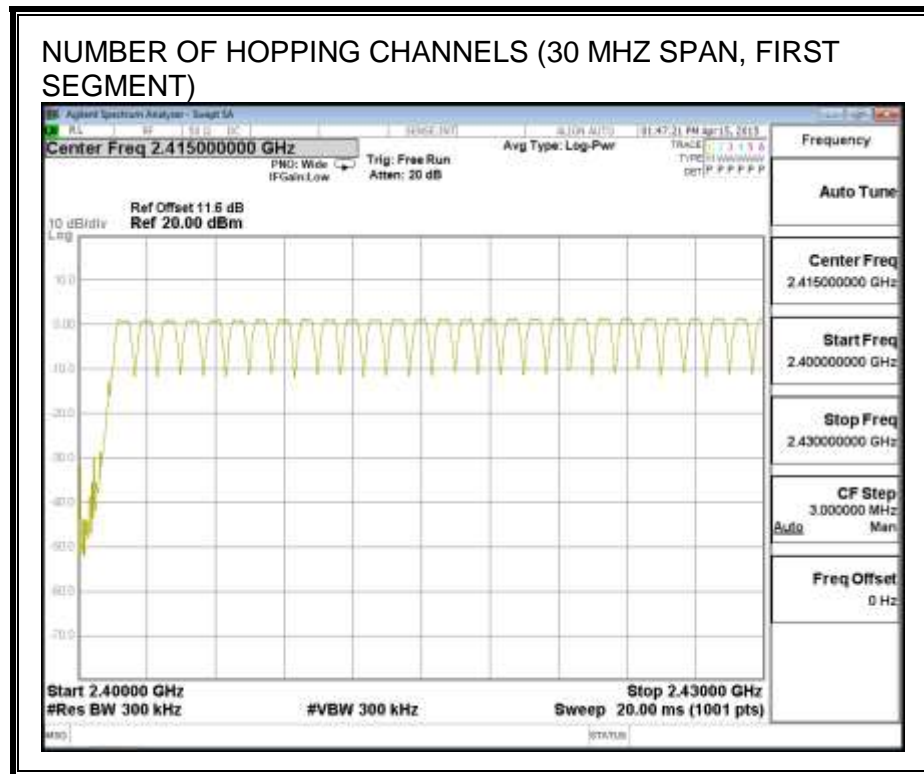
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

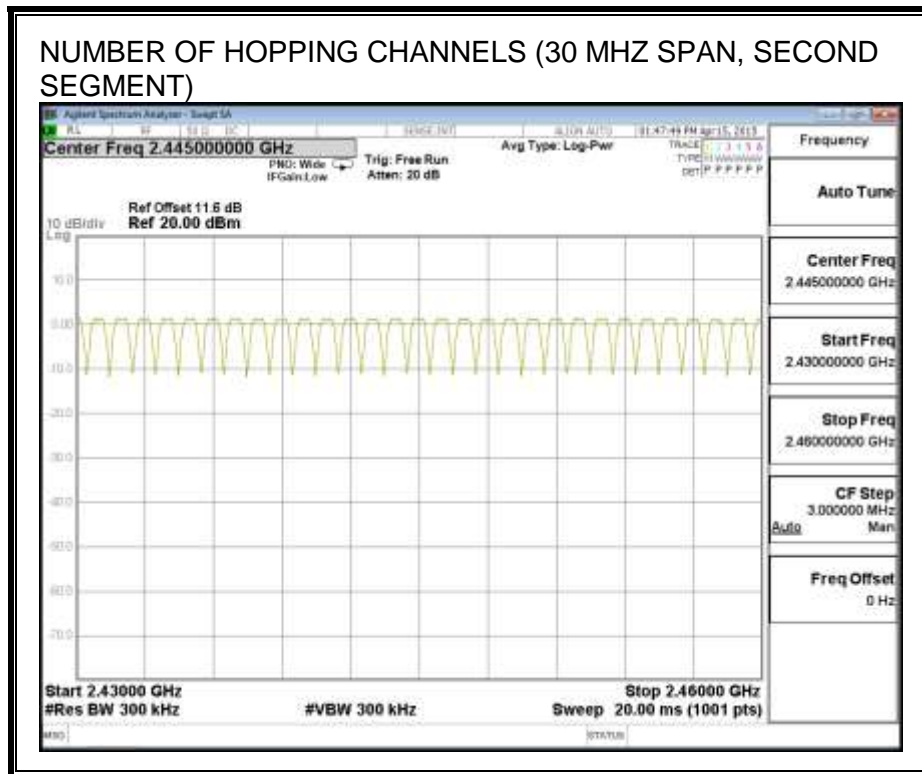
RESULTS

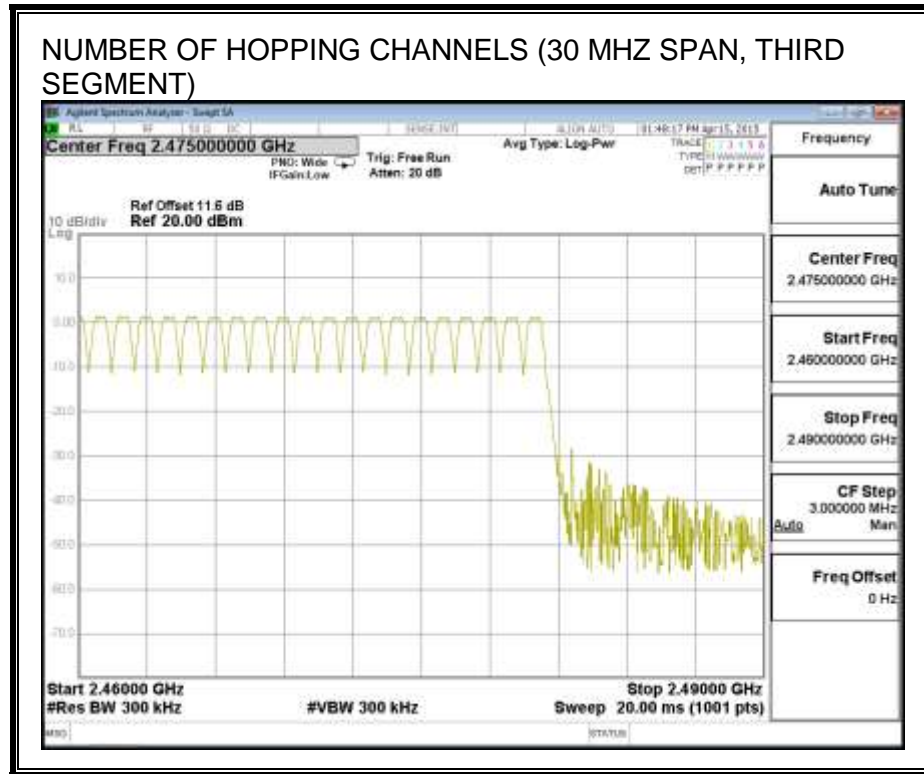
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS









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 $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{pulse width}$.

RESULTS

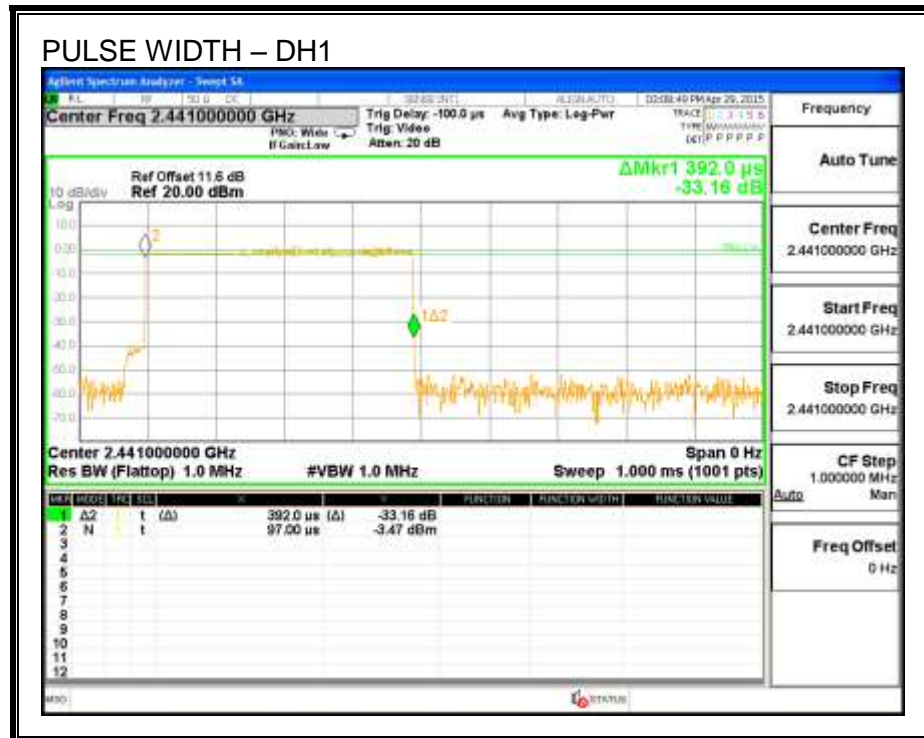
Time Of Occupancy = $10 * xx \text{ pulses} * yy \text{ msec} = zz \text{ msec}$

8PSK (EDR) Mode

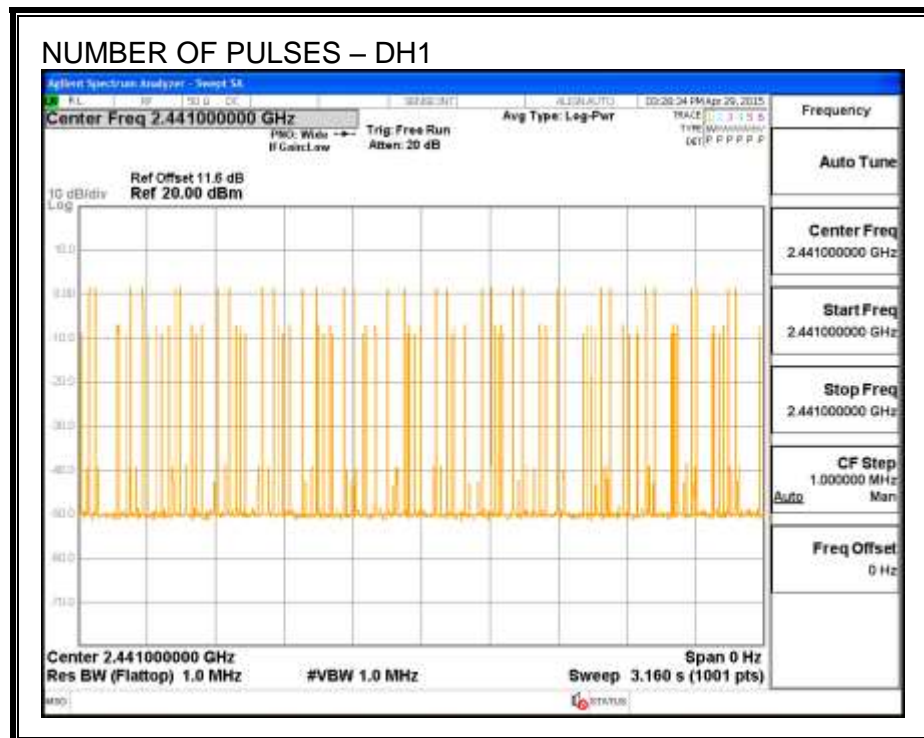
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
DH1	0.392	31	0.122	0.4	-0.278
DH3	1.642	16	0.263	0.4	-0.137
DH5	3.004	9	0.270	0.4	-0.130

Note: for AFH (8PSK) mode, please refer to the results of AFH (GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate on section 7.2.4 demonstrates compliance with channel occupancy when AFH is employed.

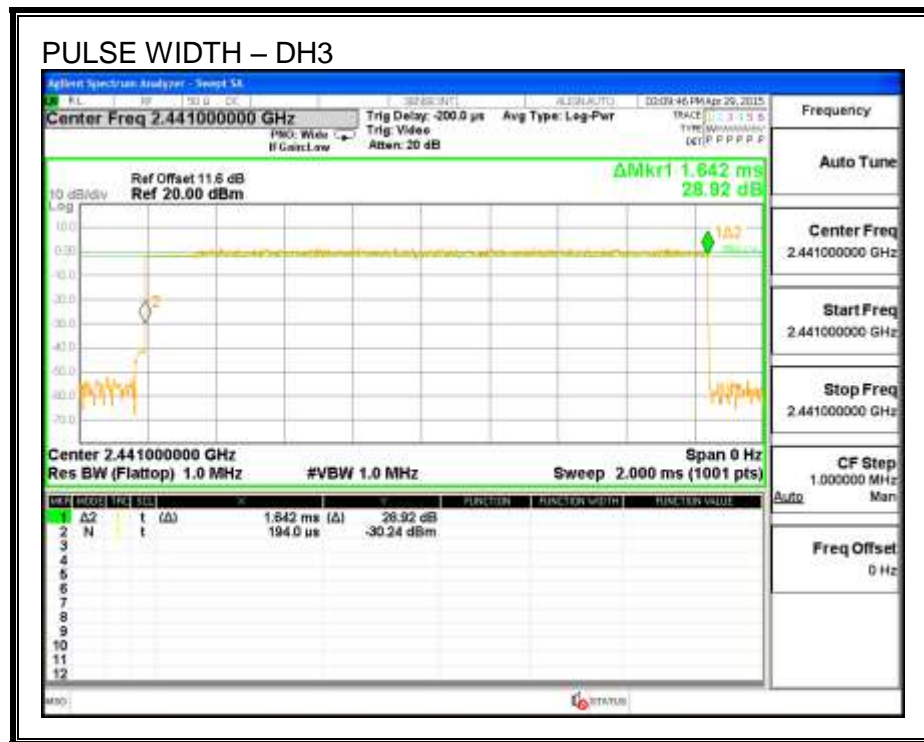
PULSE WIDTH - DH1



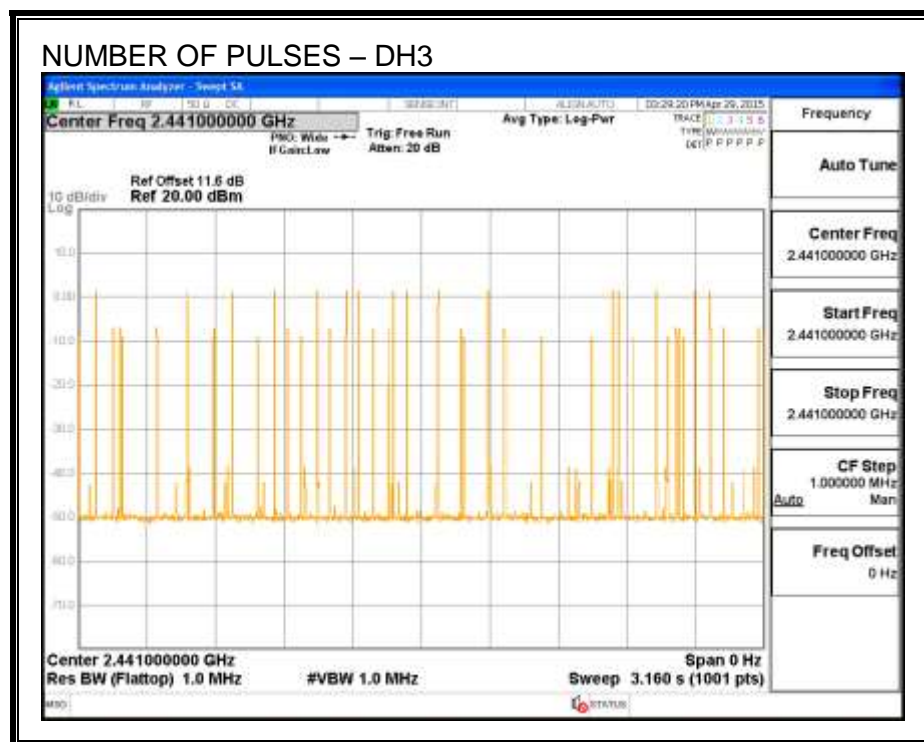
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



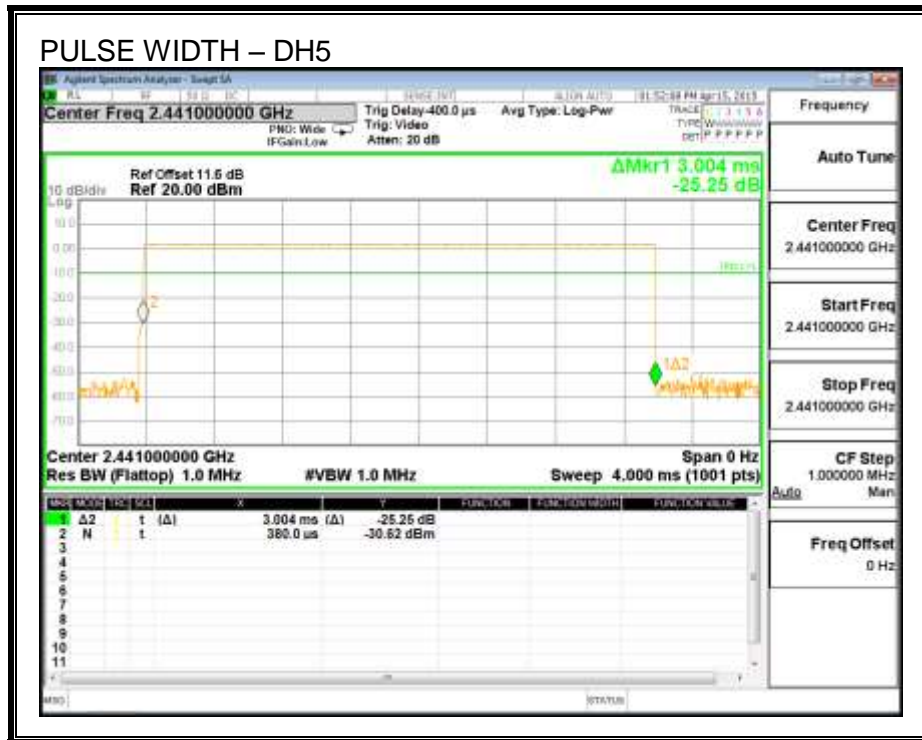
PULSE WIDTH – DH3



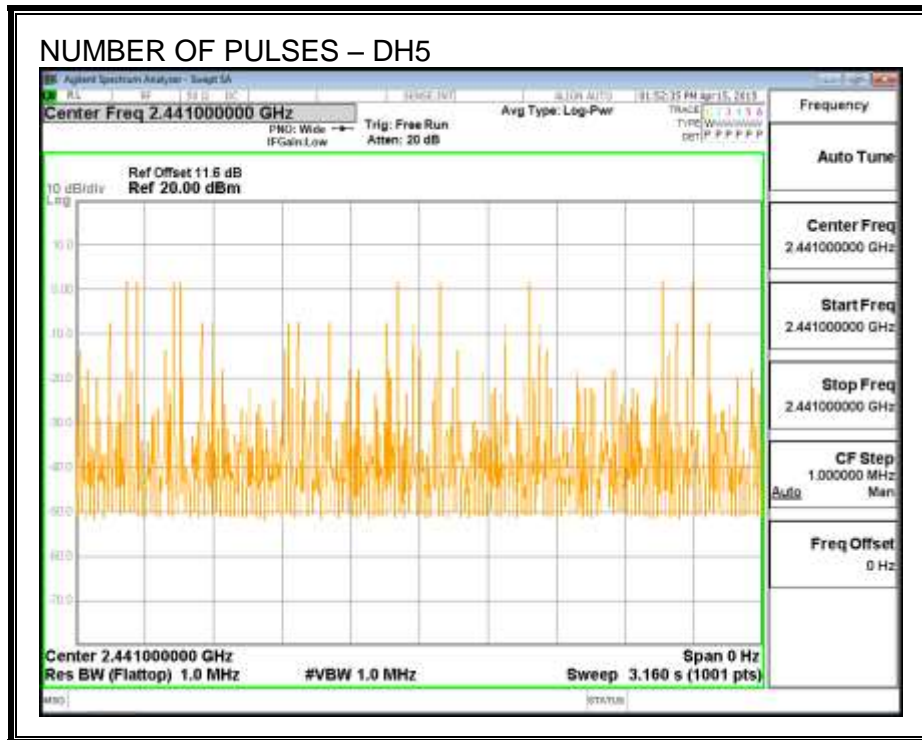
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.2.5. 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-210 Clause A8.4 (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.

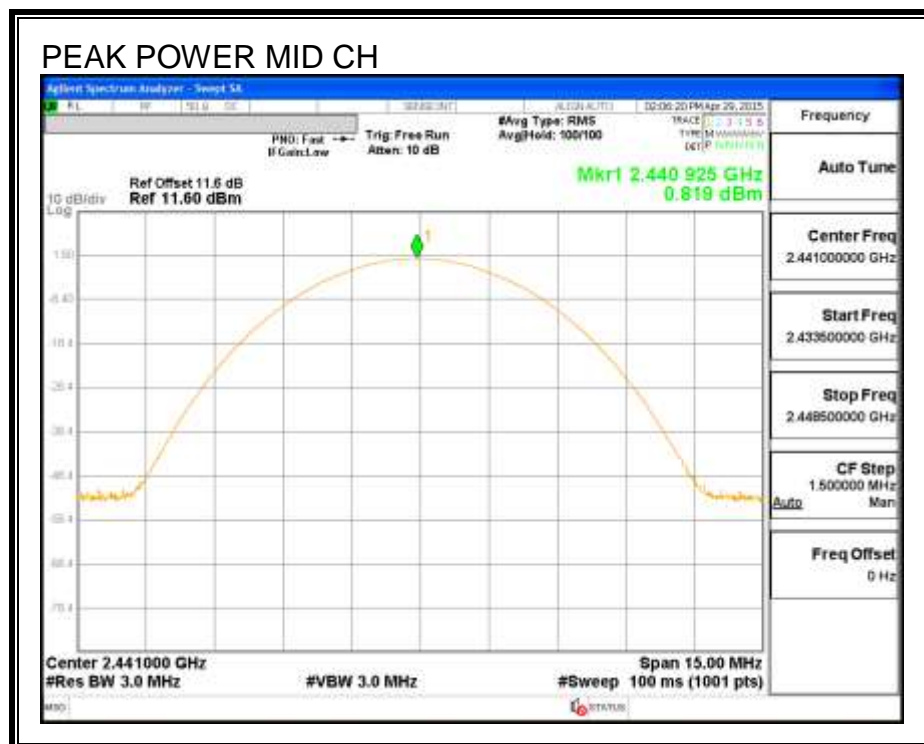
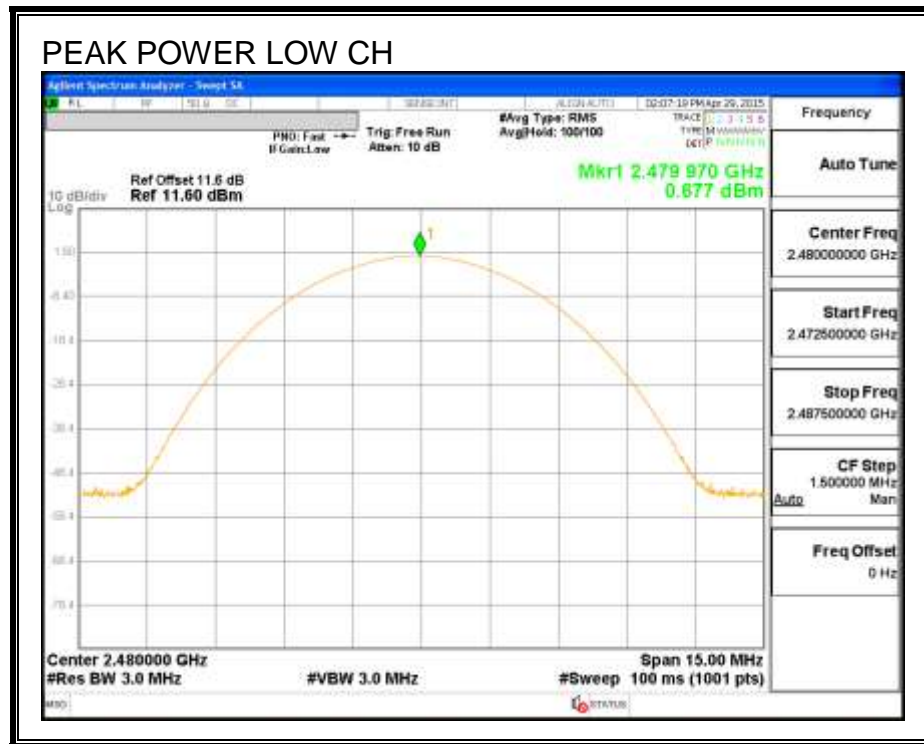
TEST PROCEDURE

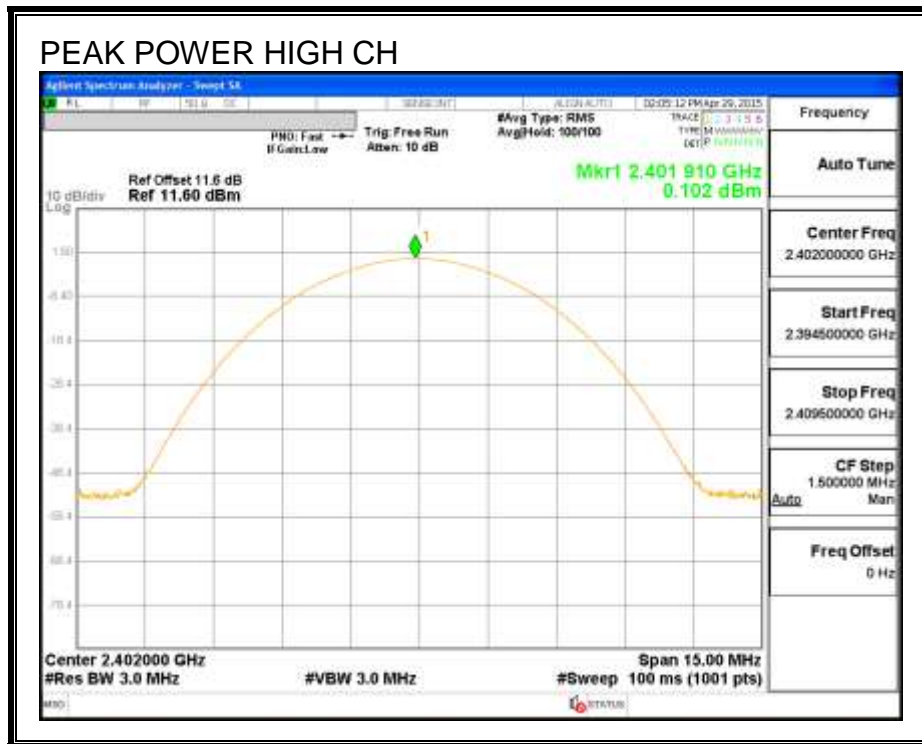
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

Channel	Frequency (MHz)	Output Power (dBm)	Directional Gain (dBi)	Limit (dBm)	Margin (dB)
Low	2402	0.68	4.00	21	-20.32
Middle	2441	0.82	4.00	21	-20.18
High	2480	0.10	4.00	21	-20.90

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 10.5 dB (including 10 dB pad and 0.5 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	-3.98
Middle	2441	-3.52
High	2480	-3.70

7.2.7. 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-210 A8.5

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

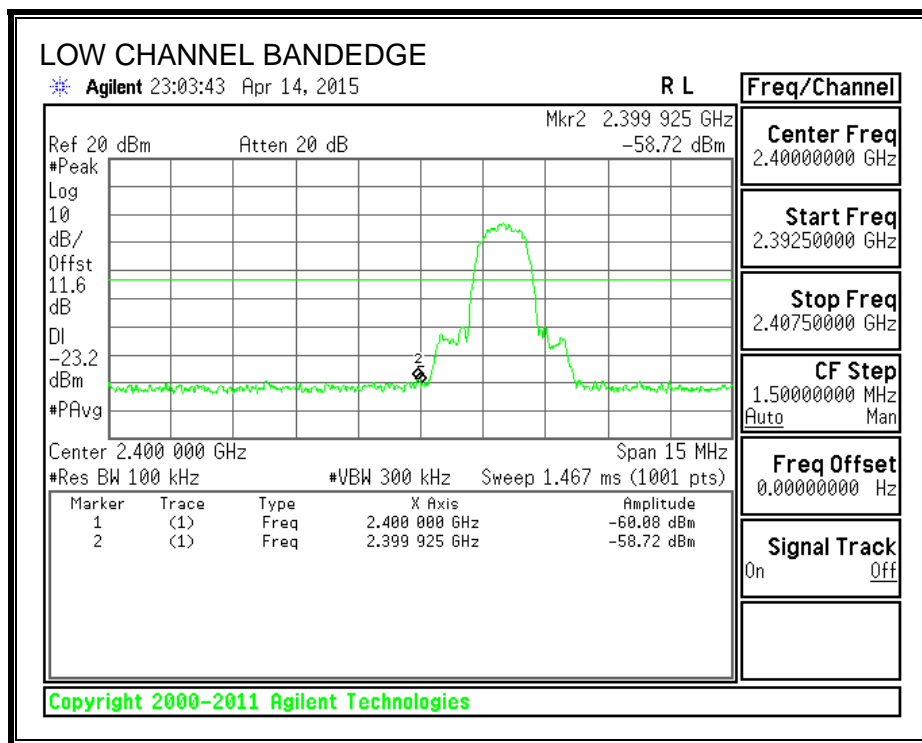
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

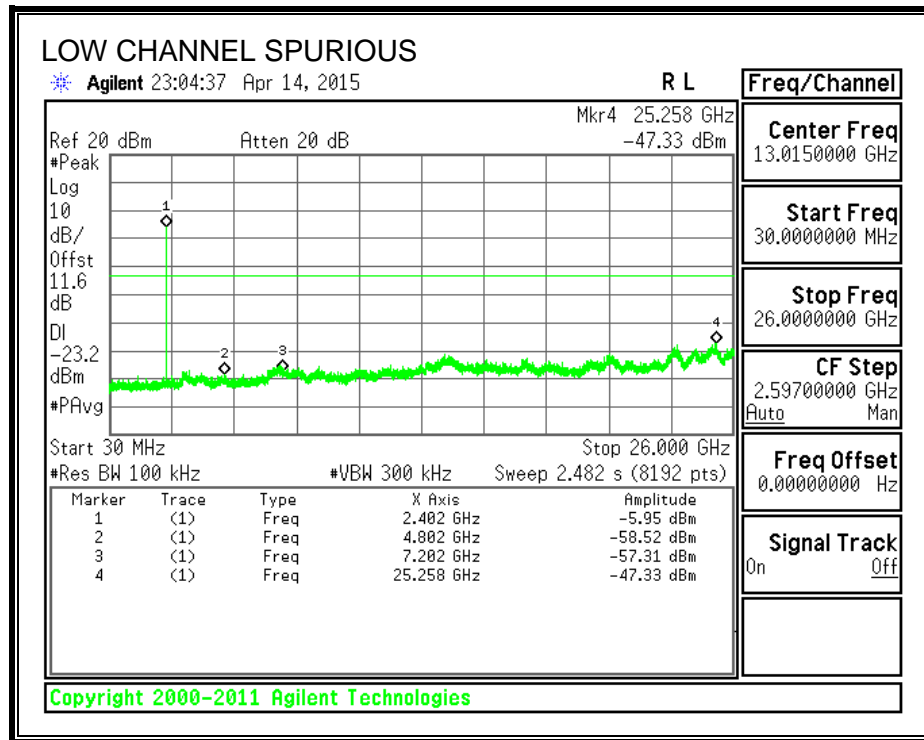
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

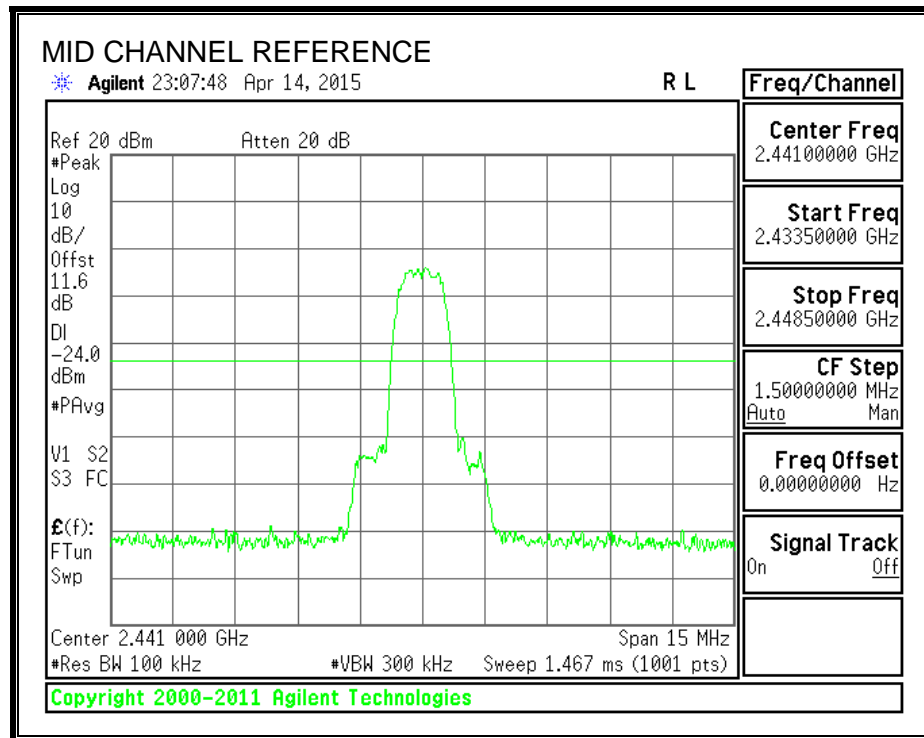
RESULTS

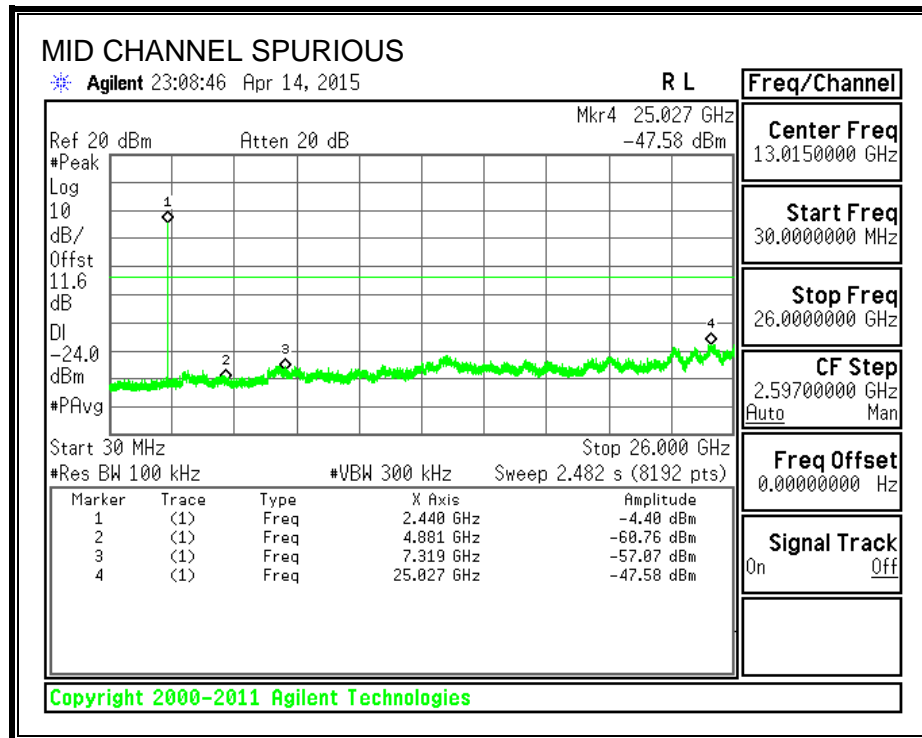
SPURIOUS EMISSIONS, LOW CHANNEL



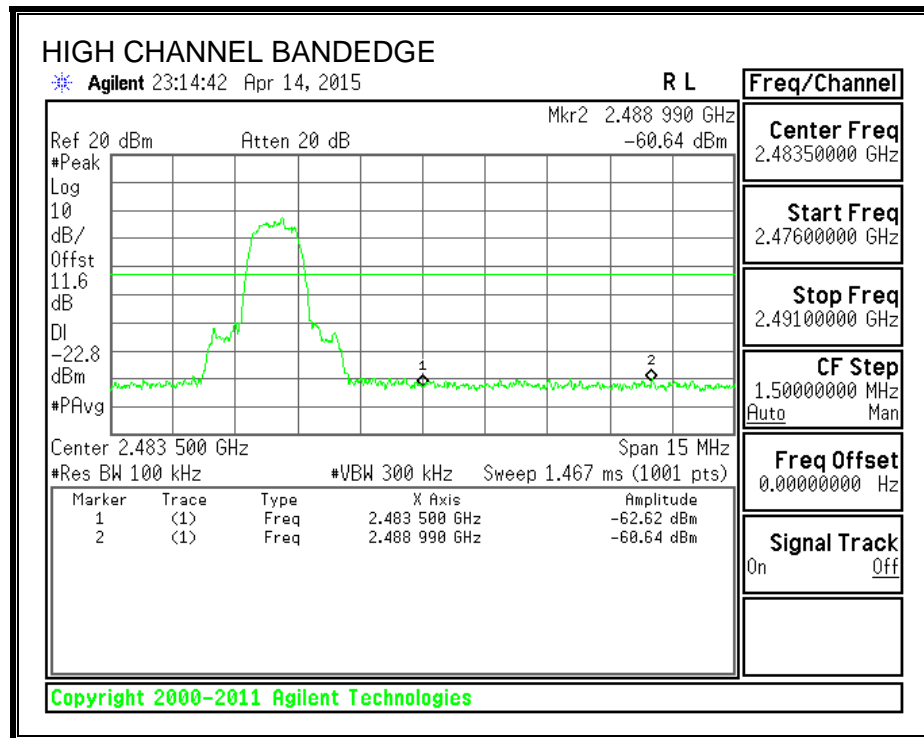


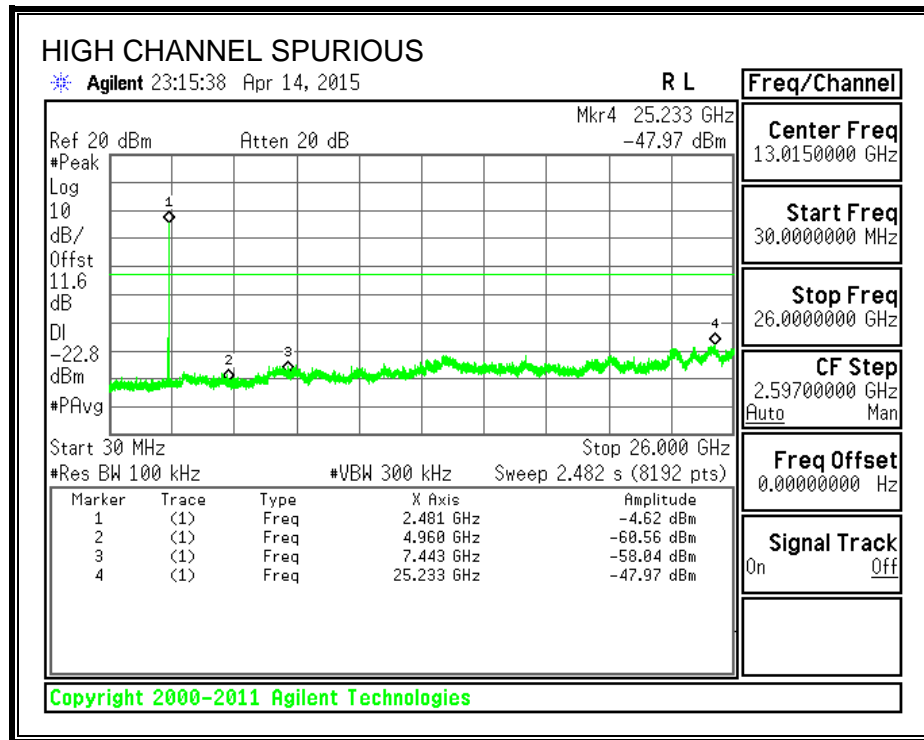
SPURIOUS EMISSIONS, MID CHANNEL



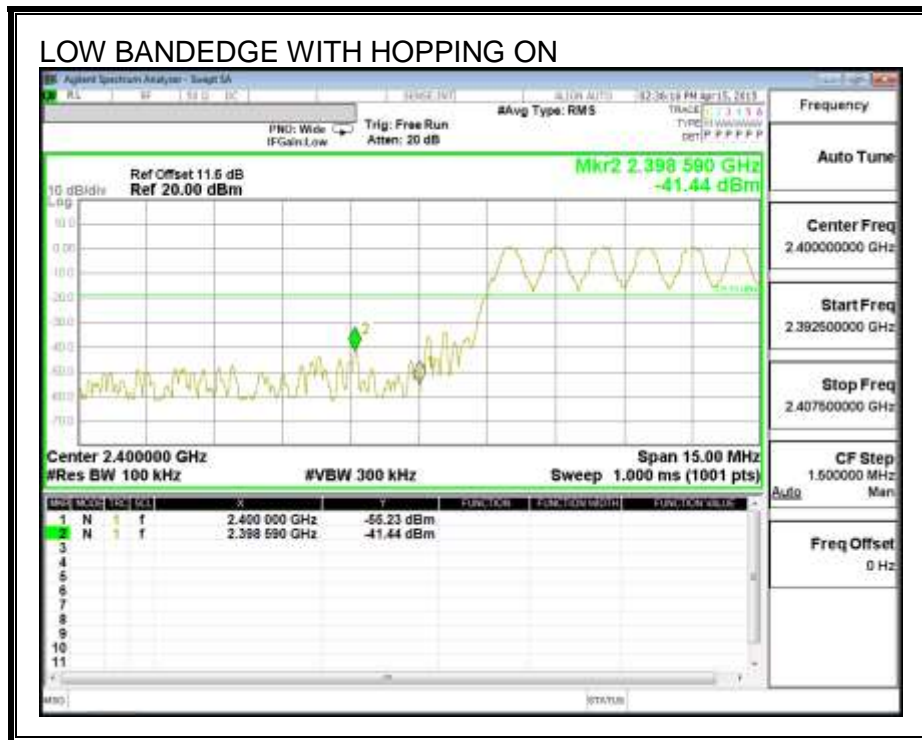


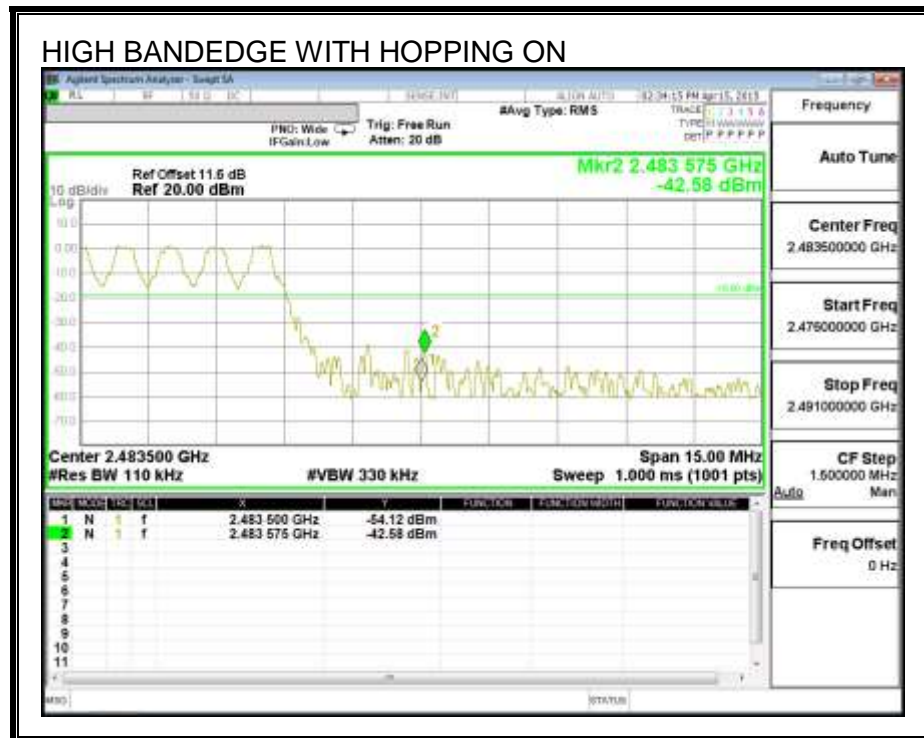
SPURIOUS EMISSIONS, HIGH CHANNEL





SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

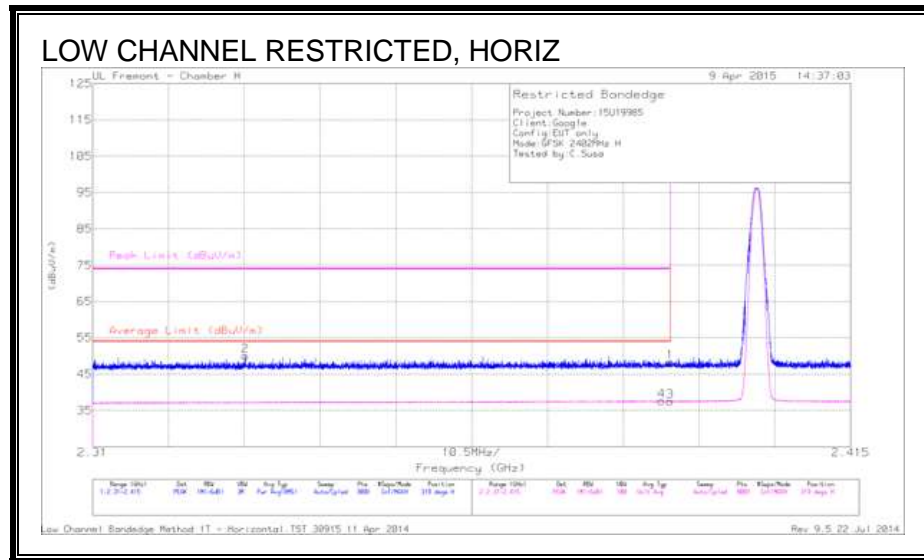
IC RSS-GEN Clause 8.9 (Transmitter)

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

8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fitr/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
2	* 2.331	42.75	PK	31.9	-24.6	1.14	51.19	-	-	74	-22.81	319	287	H
4	* 2.389	30.1	VB1T	32.1	-24.6	1.14	38.74	54	-15.26	-	-	319	287	H
1	* 2.39	40.78	PK	32.1	-24.6	1.14	49.42	-	-	74	-24.58	319	287	H
3	* 2.39	30.05	VB1T	32.1	-24.6	1.14	38.69	54	-15.31	-	-	319	287	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

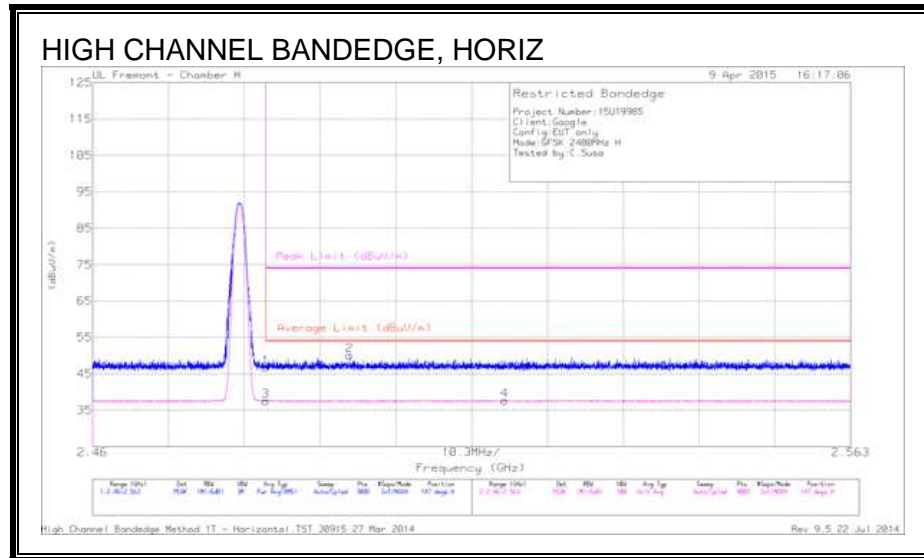
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Filtr/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
2	* 2.376	42.37	PK	32.1	-24.6	1.14	51.01	-	-	74	-22.99	269	294	V
4	* 2.387	30.03	VB1T	32.1	-24.5	1.14	38.77	54	-15.23	-	-	269	294	V
1	* 2.39	39.6	PK	32.1	-24.6	1.14	48.24	-	-	74	-25.76	269	294	V
3	* 2.39	29.95	VB1T	32.1	-24.6	1.14	38.59	54	-15.41	-	-	269	294	V

VB1T - FHSS Method: $VB=1/T_{on}$, Voltage Averaging Max Hold where: T_{on} is the duration of the packet

AUTHORIZED BANDEDGE (HIGH CHANNEL)



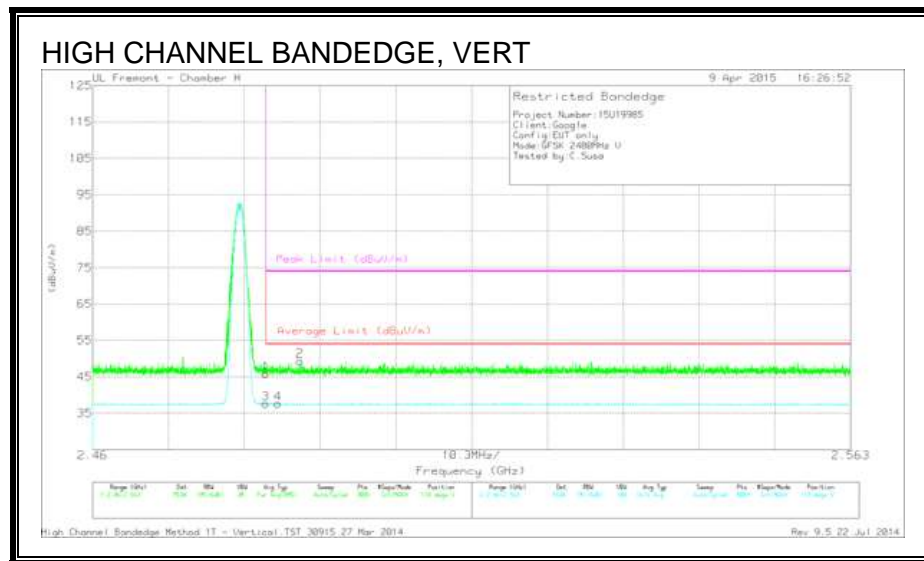
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fitr/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	39.08	PK	32.1	-24.5	1.14	47.82	-	-	74	-26.18	147	219	H
2	* 2.495	42.4	PK	32.1	-24.5	1.14	51.14	-	-	74	-22.86	147	219	H
3	* 2.484	29.9	VB1T	32.1	-24.5	1.14	38.64	54	-15.36	-	-	147	219	H
4	2.516	30.09	VB1T	32	-24.4	1.14	38.83	54	-15.17	-	-	147	219	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

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



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fitr/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	38.2	PK	32.1	-24.5	1.14	46.94	-	-	74	-27.06	118	332	V
3	* 2.484	30	VB1T	32.1	-24.5	1.14	38.74	54	-15.26	-	-	118	332	V
4	* 2.485	30.01	VB1T	32.1	-24.5	1.14	38.75	54	-15.25	-	-	118	332	V
2	* 2.488	41.76	PK	32.1	-24.5	1.14	50.50	-	-	74	-23.5	118	332	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

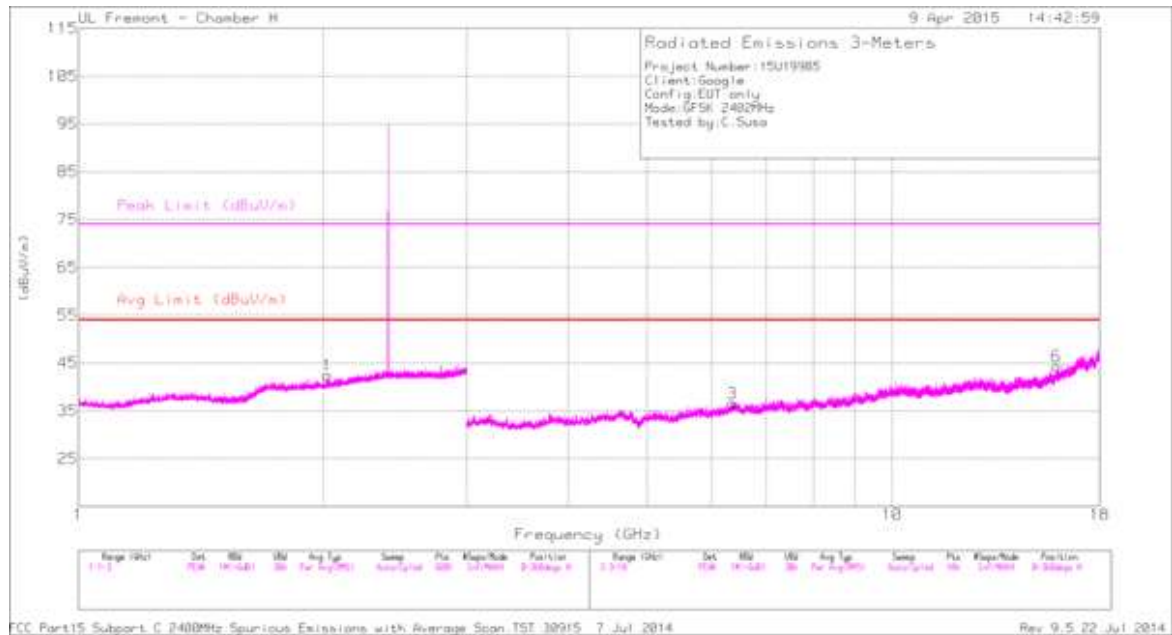
PK - Peak detector

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

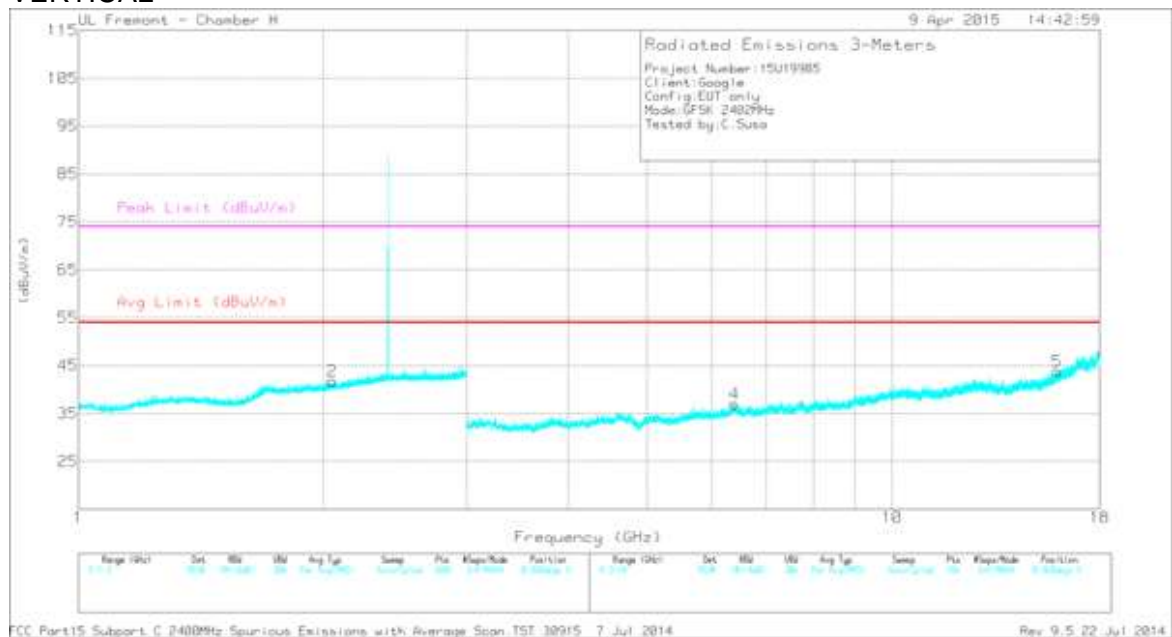
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/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
6	* 15.928	35.12	PK3	40.5	-24.5	1.14	52.26	-	-	74	-21.74	177	230	H
	* 15.927	22.63	VB1T	40.5	-24.5	1.14	39.77	54	-14.23	-	-	177	230	H
5	* 15.945	35.28	PK3	40.4	-24.3	1.14	52.52	-	-	74	-21.48	74	187	V
	* 15.942	23	VB1T	40.4	-24.3	1.14	40.24	54	-13.76	-	-	74	187	V
1	2.026	42.89	PK3	30.6	-24.9	1.14	49.73	-	-	-	-	226	244	H
2	2.052	43.19	PK3	30.7	-24.9	1.14	50.13	-	-	-	-	190	265	V
3	6.353	41.24	PK3	35.3	-31	1.14	46.68	-	-	-	-	158	247	H
4	6.406	39.74	PK3	35.3	-30.2	1.14	45.98	-	-	-	-	196	231	V

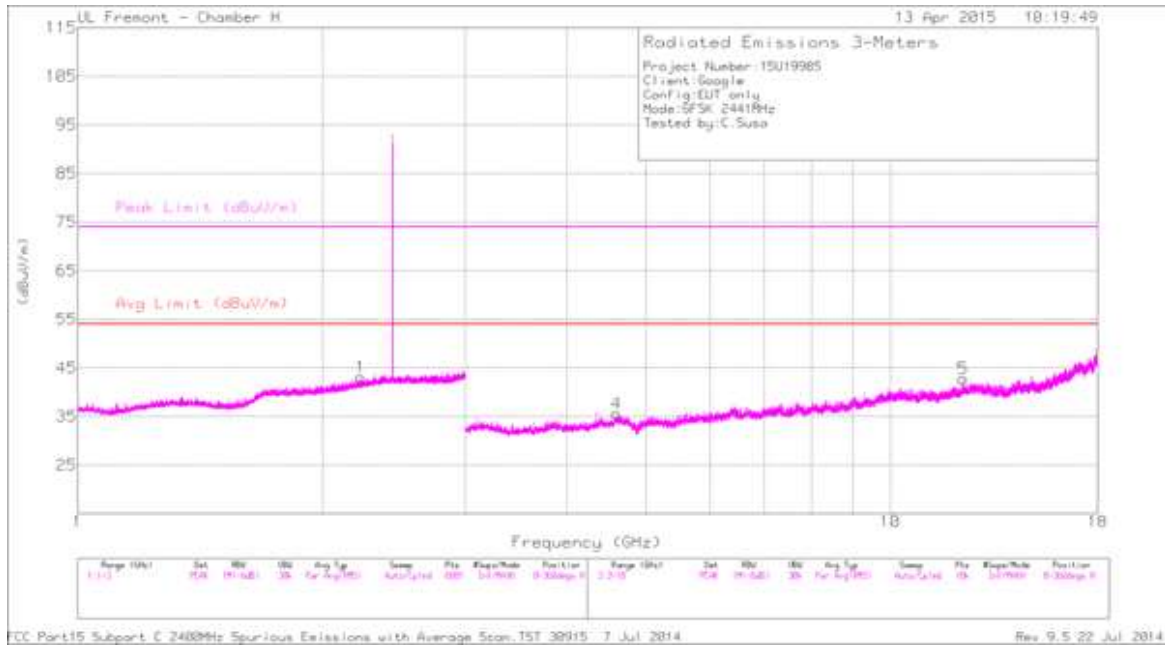
* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK3 - FHSS Method: Maximum Peak

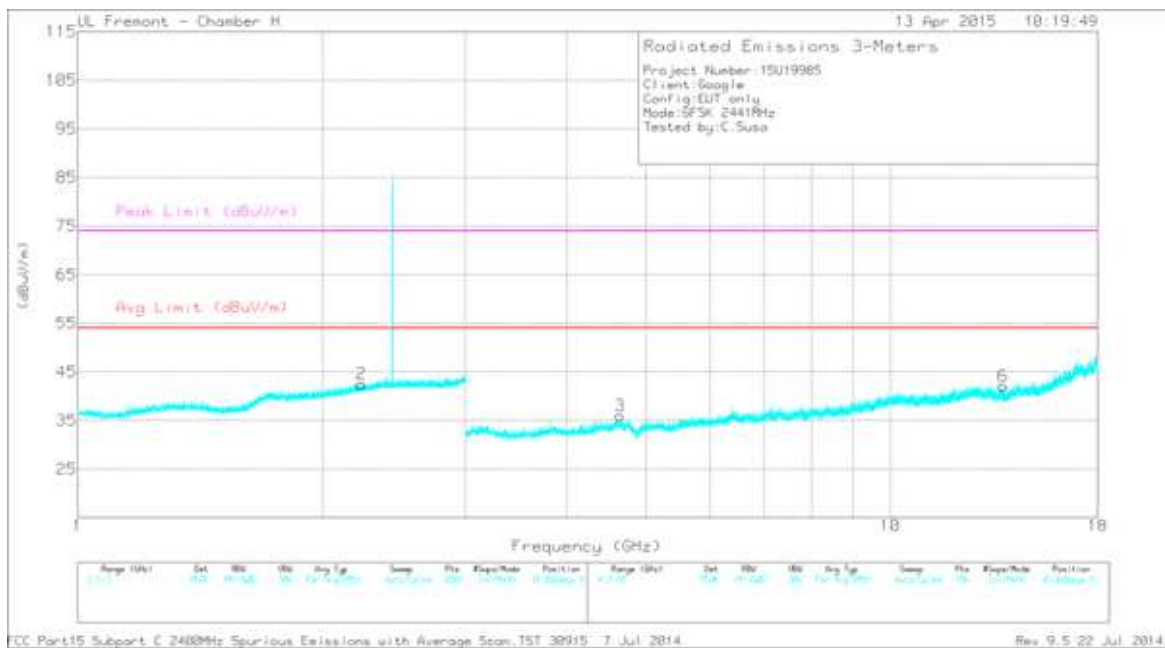
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

MID CHANNEL

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequenc y (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl /Filtr/Pad (dB)	DC Corr (dB)	Correcte d Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarit y
1	* 2.232	43.2	PK3	31.5	-24.6	1.14	51.24	-	-	74	-22.76	316	123	H
	* 2.232	30.3	VB1T	31.5	-24.7	1.14	38.24	54	-15.76	-	-	316	123	H
2	* 2.235	43.31	PK3	31.5	-24.7	1.14	51.25	-	-	74	-22.75	113	351	V
	* 2.232	30.35	VB1T	31.5	-24.7	1.14	38.29	54	-15.71	-	-	113	351	V
4	* 4.603	41.56	PK3	33.8	-32.4	1.14	44.10	-	-	74	-29.9	162	214	H
	* 4.602	29.21	VB1T	33.8	-32.4	1.14	31.75	54	-23.39	-	-	162	214	H
5	* 12.29	35.78	PK3	38.2	-24.8	1.14	50.32	-	-	74	-23.68	189	289	H
	* 12.294	23.25	VB1T	38.2	-24.8	1.14	37.79	54	-16.21	-	-	189	289	H
3	* 4.654	40.91	PK3	33.9	-31.8	1.14	44.15	-	-	74	-29.85	8	250	V
	* 4.654	28.54	VB1T	33.9	-31.8	1.14	31.78	54	-22.22	-	-	8	250	V
6	13.772	36.04	PK3	38.6	-26.4	1.14	49.38	-	-	-	-	360	253	V

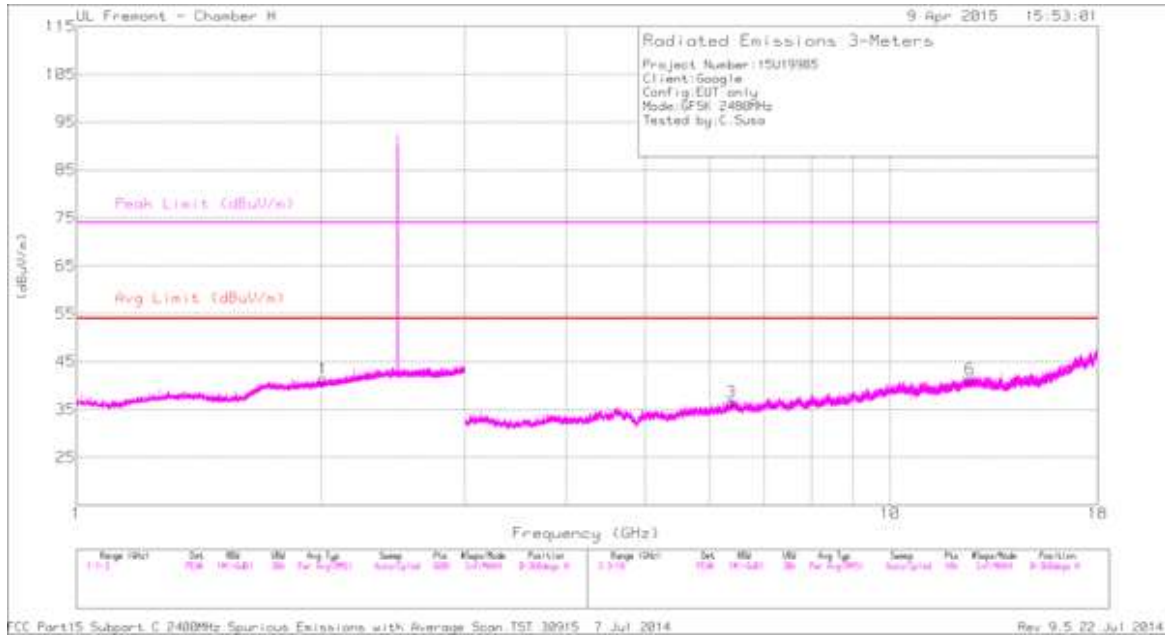
* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK3 - FHSS Method: Maximum Peak

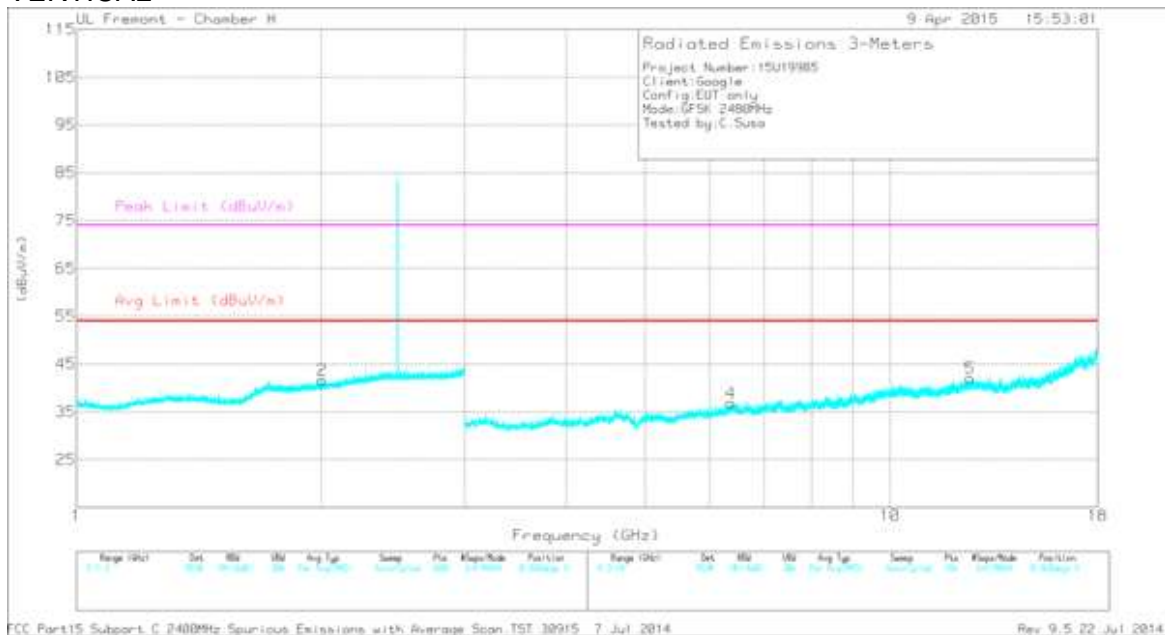
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HIGH CHANNEL

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/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
6	* 12.545	36.31	PK3	38.6	-25.5	1.14	50.55	-	-	74	-23.45	35	225	H
	* 12.547	23.61	VB1T	38.6	-25.5	1.14	37.85	54	-16.15	-	-	35	225	H
5	* 12.541	35.71	PK3	38.6	-25.4	1.14	50.05	-	-	74	-23.95	134	248	V
	* 12.541	23.6	VB1T	38.6	-25.4	1.14	37.94	54	-16.06	-	-	134	248	V
2	2.006	43.4	PK3	30.5	-24.9	1.14	50.14	-	-	-	-	316	279	V
1	2.008	43.43	PK3	30.5	-24.9	1.14	50.17	-	-	-	-	331	242	H
4	6.365	39.81	PK3	35.3	-30.6	1.14	45.65	-	-	-	-	178	282	V
3	6.382	39.22	PK3	35.3	-30.3	1.14	45.36	-	-	-	-	222	306	H

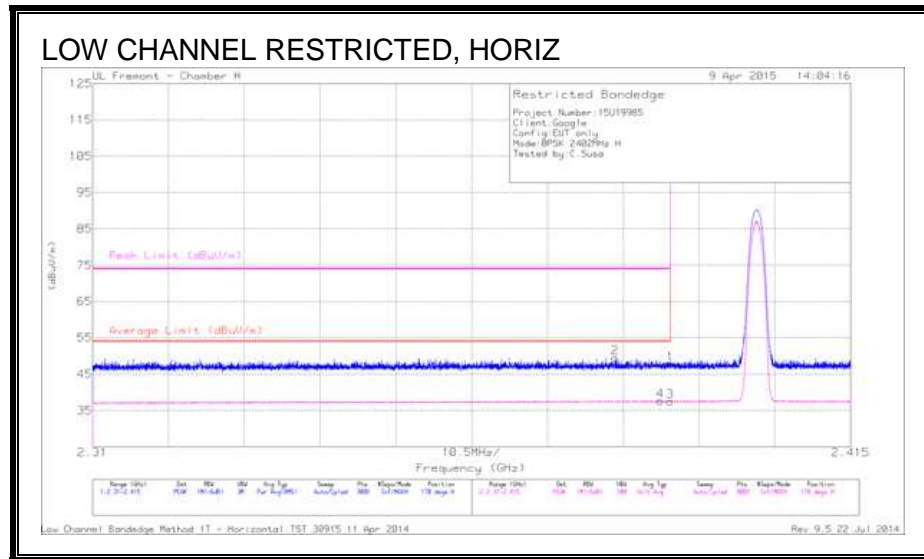
* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK3 - FHSS Method: Maximum Peak

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

8.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)



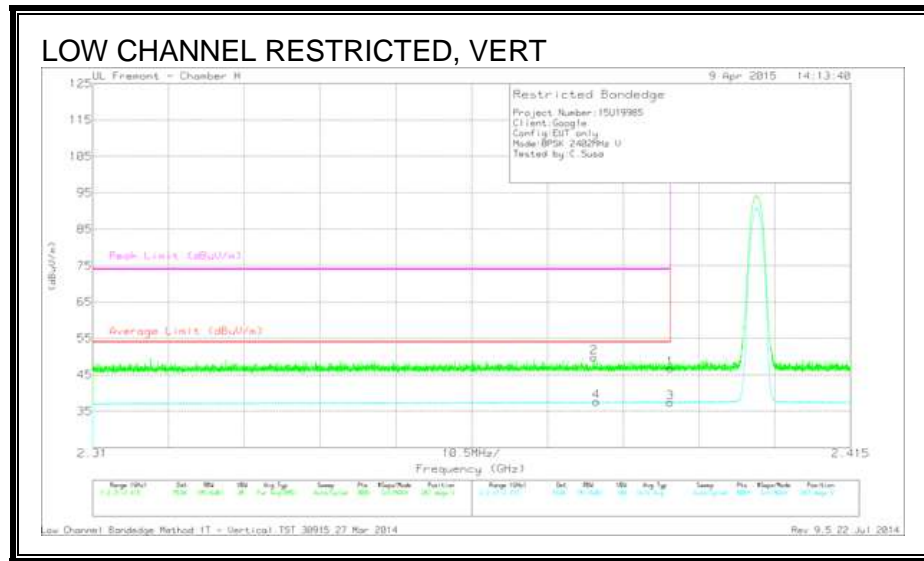
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Filtr/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
2	* 2.382	41.99	PK	32.1	-24.6	1.12	50.63	-	-	74	-23.37	170	357	H
4	* 2.389	30.08	VB1T	32.1	-24.6	1.12	38.7	54	-15.3	-	-	170	357	H
1	* 2.39	40.33	PK	32.1	-24.6	1.12	48.95	-	-	74	-25.05	170	357	H
3	* 2.39	29.95	VB1T	32.1	-24.6	1.12	38.57	54	-15.43	-	-	170	357	H

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

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



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fitr/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
2	* 2.379	42.32	PK	32.1	-24.6	1.12	50.94	-	-	74	-23.06	287	292	V
4	* 2.38	30.11	VB1T	32.1	-24.6	1.12	38.73	54	-15.27	-	-	287	292	V
1	* 2.39	39.21	PK	32.1	-24.6	1.12	47.83	-	-	74	-26.17	287	292	V
3	* 2.39	29.9	VB1T	32.1	-24.6	1.12	38.52	54	-15.48	-	-	287	292	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK - Peak detector

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

HIGH CHANNEL BANDEDGE, HORIZ

UL Frontport - Chamber H

9 Apr 2015 13:44:56

Restricted Bonded

Project Number: ISU1995
 Client: Google
 Config: EUT only
 Model: BPSX 2400MHz H
 Tested by: C. Soto

(dBuV/m)

Peak Limit (dBuV/m)

Average Limit (dBuV/m)

18 GHz/

Frequency (GHz)

Range (dBuV/m)	Set	Min	Max	Avg	Unit	Display	Plot	Range	Function
1.2 to 120	120	(N/A)	120	120	dBuV/m	dBuV/m	120	120	120

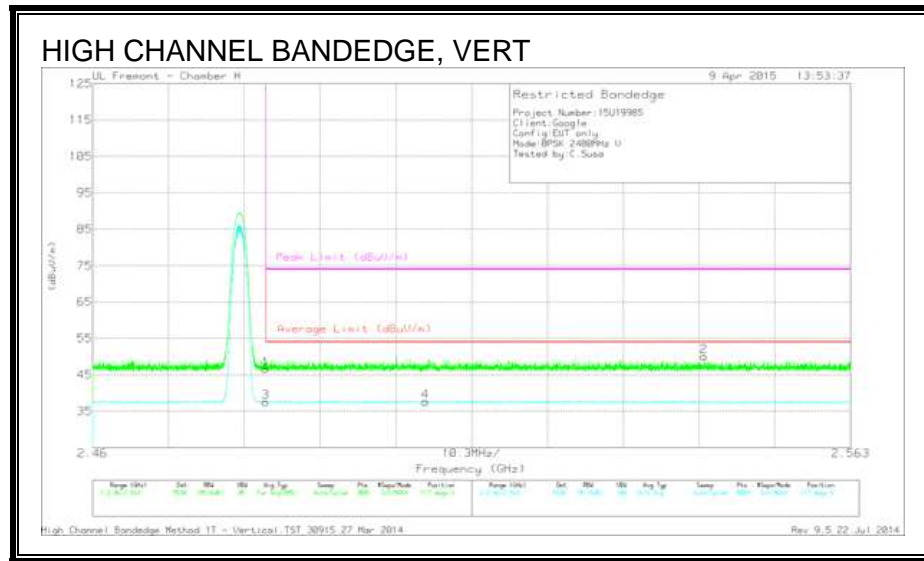
Range (dBuV/m)	Set	Min	Max	Avg	Unit	Display	Plot	Range	Function
2.45 to 125	125	(N/A)	125	125	dBuV/m	dBuV/m	125	125	125

High Channel Bandedge Method IT - Horizontal TST 201515, 27 Mar 2014

Rev 9.5, 22 Jul 2014

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Filtr/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	39.53	PK	32.1	-24.5	1.12	48.25	-	-	74	-25.75	141	219	H
3	* 2.484	29.81	VB1T	32.1	-24.5	1.12	38.53	54	-15.47	-	-	141	219	H
4	* 2.493	30.02	VB1T	32.1	-24.5	1.12	38.74	54	-15.26	-	-	141	219	H
2	2.563	41.73	PK	32	-24.3	1.12	50.55	-	-	74	-23.45	141	219	H

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



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/Fitr/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	39.02	PK	32.1	-24.5	1.12	47.74	-	-	74	-26.26	117	336	V
3	* 2.484	29.94	VB1T	32.1	-24.5	1.12	38.66	54	-15.34	-	-	117	336	V
4	2.505	29.98	VB1T	32.1	-24.4	1.12	38.80	54	-15.2	-	-	117	336	V
2	2.543	42.49	PK	32	-24.4	1.12	51.21	-	-	74	-23.79	117	336	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

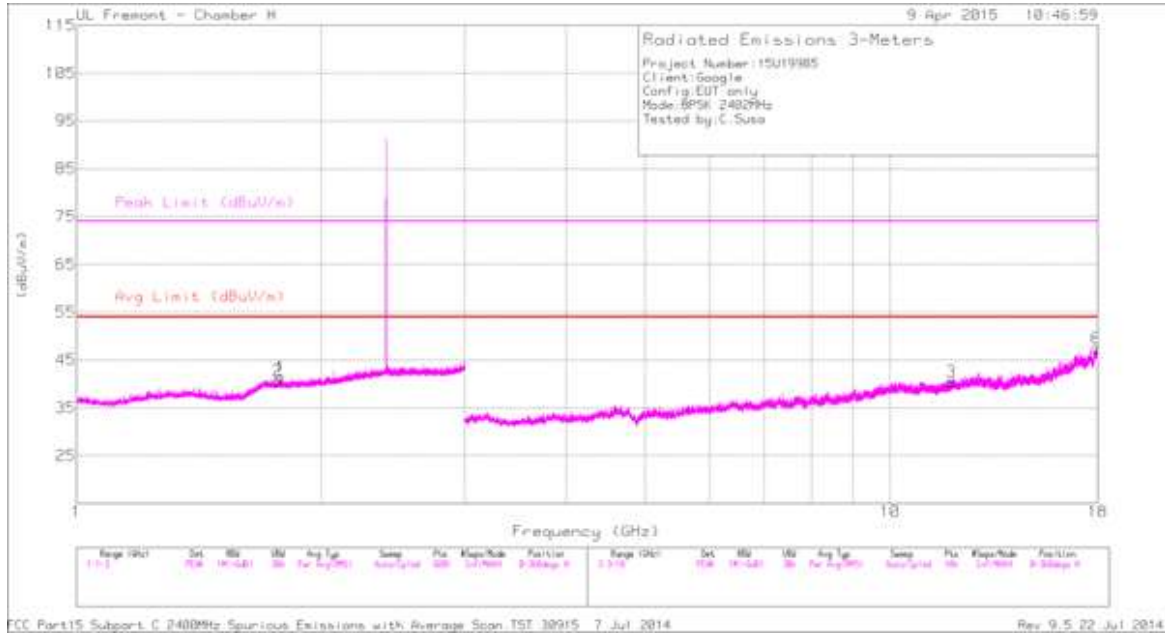
PK - Peak detector

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

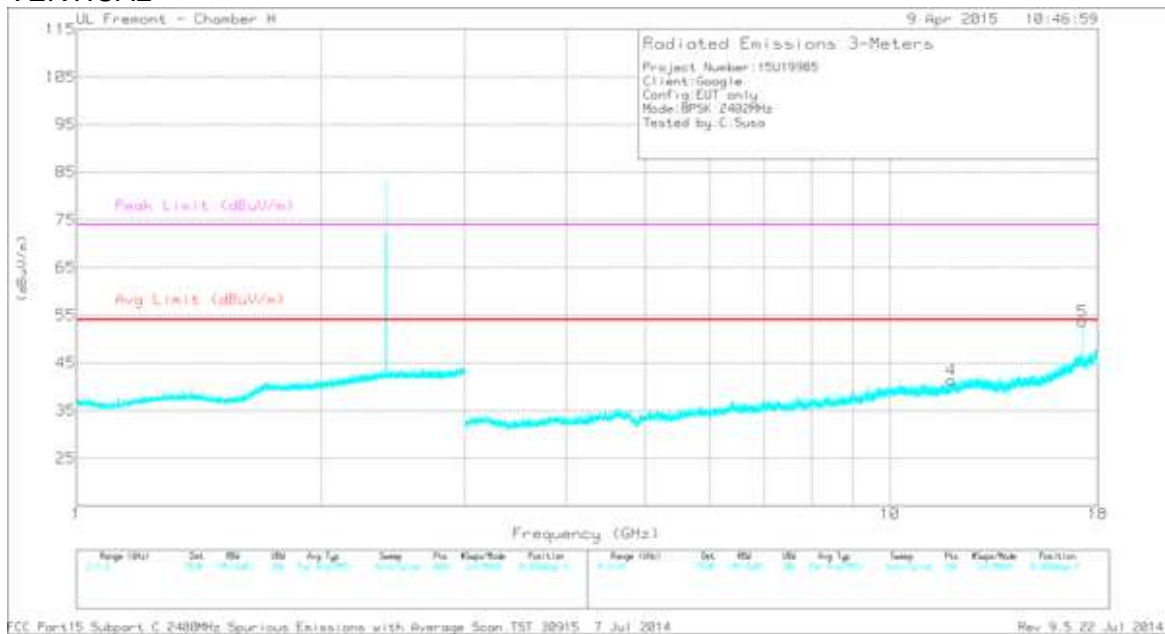
HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/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
3	* 11.889	35.64	PK3	38	-25.7	1.12	49.06	-	-	74	-24.94	256	252	H
	* 11.889	23.36	VB1T	38	-25.7	1.12	36.78	54	-17.22	-	-	256	252	H
6	* 17.923	32.89	PK3	42.7	-20.8	1.12	55.91	-	-	74	-18.09	208	281	H
	* 17.924	20.8	VB1T	42.7	-20.9	1.12	43.72	54	-10.28	-	-	208	281	H
3	* 11.893	35.53	PK3	38	-25.7	1.12	48.95	-	-	74	-25.05	247	265	V
	* 11.894	23.37	VB1T	38	-25.6	1.12	36.89	54	-17.11	-	-	247	265	V
2	1.769	43.48	PK3	30.2	-25.1	1.12	49.7	-	-	-	-	151	239	H
1	1.782	43.99	PK3	30.2	-25.1	1.12	50.21	-	-	-	-	45	260	H
5	17.244	35.21	PK3	42.2	-22.6	1.12	55.93	-	-	-	-	171	370	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

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

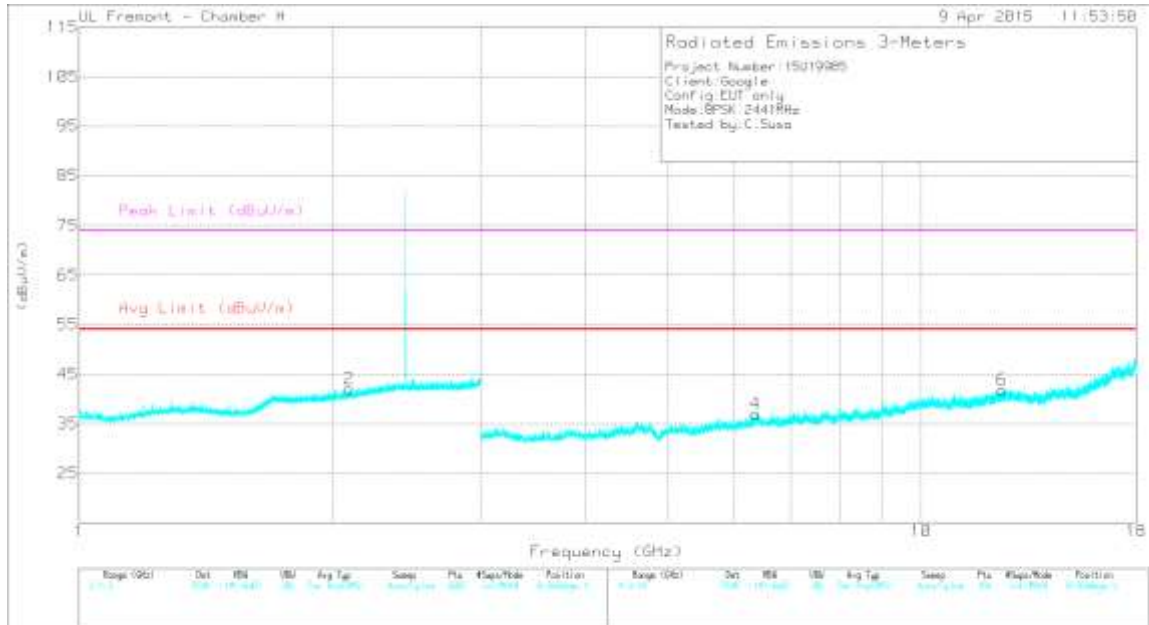
HORIZONTAL



FCC Part 15 Subpart C 2400MHz Spurious Emissions with Average Scan TST 30015 7 Jul 2014

Rev. 9.5.22 Jul 2014

VERTICAL



FCC Part 15 Subpart C 2400MHz Spurious Emissions with Average Scan TST 30015 7 Jul 2014

Rev. 9.5.22 Jul 2014

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/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
5	* 12.481	35.7	PK3	38.6	-25.6	1.12	49.82	-	-	74	-24.18	47	247	H
	* 12.482	23.43	VB1T	38.6	-25.6	1.12	37.55	54	-16.45	-	-	47	247	H
6	* 12.477	36.11	PK3	38.6	-25.6	1.12	50.23	-	-	74	-23.77	6	258	V
	* 12.474	23.57	VB1T	38.6	-25.6	1.12	37.69	54	-16.31	-	-	6	258	V
1	2.084	43.33	PK3	30.8	-24.9	1.12	50.35	-	-	-	-	180	262	H
2	2.093	43.48	PK3	30.8	-24.9	1.12	50.50	-	-	-	-	224	271	V
4	6.363	39.93	PK3	35.3	-30.6	1.12	45.75	-	-	-	-	181	212	V
3	6.376	39.29	PK3	35.3	-30.5	1.12	45.21	-	-	-	-	233	222	H

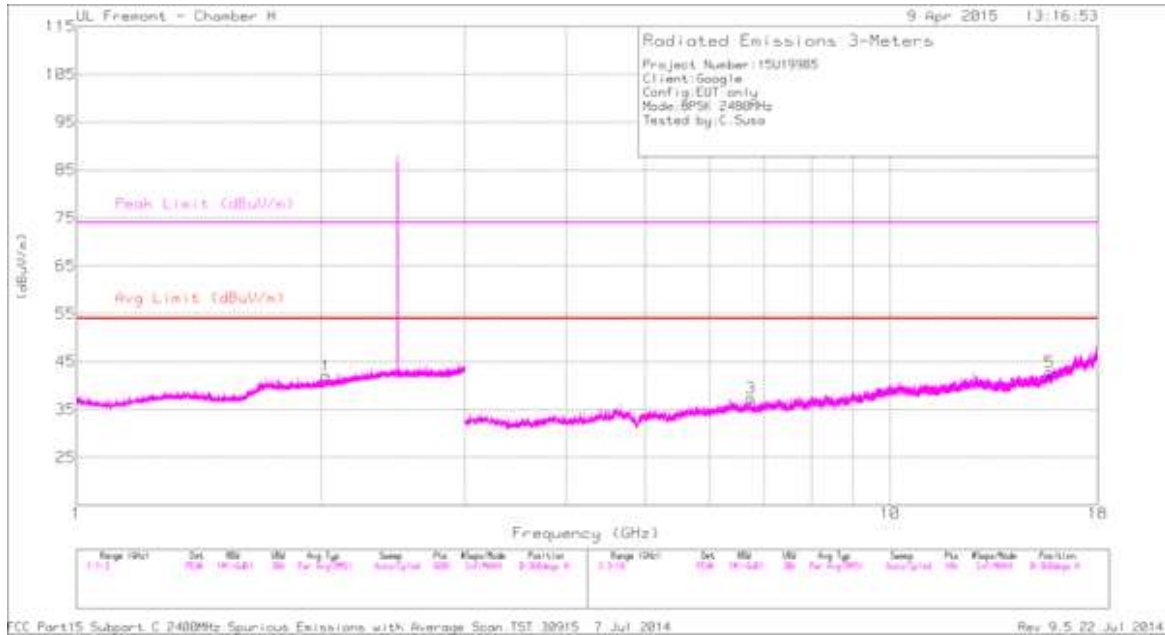
* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK3 - FHSS Method: Maximum Peak

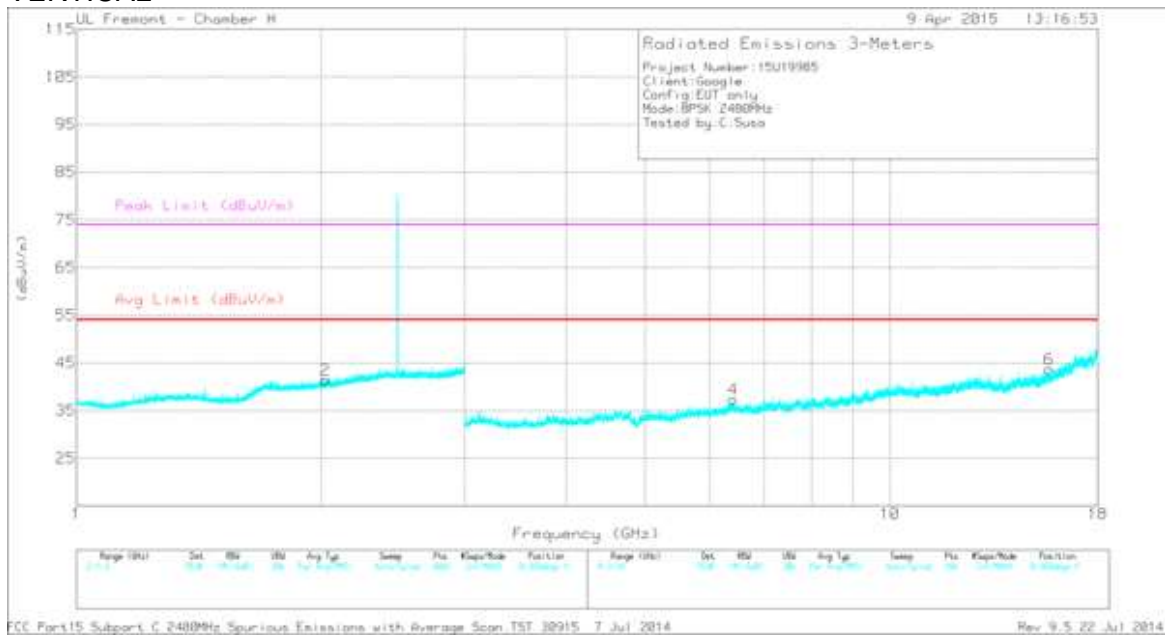
VB1T - FHSS Method: VB=1/Ton, Voltage Averaging Max Hold where: Ton is the duration of the packet

HIGH CHANNEL

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T712 (dB/m)	Amp/Cbl/ Fitr/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
5	* 15.7	34.26	PK3	40.3	-24.8	1.12	50.88	-	-	74	-23.12	354	293	H
	* 15.697	22.36	VB1T	40.3	-24.9	1.12	38.88	54	-15.12	-	-	354	293	H
6	* 15.682	35.7	PK3	40.2	-24.9	1.12	52.12	-	-	74	-21.88	318	278	V
	* 15.684	22.79	VB1T	40.2	-24.9	1.12	39.21	54	-14.79	-	-	318	278	V
2	2.024	43.01	PK3	30.6	-24.9	1.12	49.83	-	-	-	-	222	265	V
1	2.027	43.13	PK3	30.6	-24.9	1.12	49.95	-	-	-	-	170	248	H
4	6.419	39.67	PK3	35.3	-30.3	1.12	45.79	-	-	-	-	144	255	V
3	6.737	39.49	PK3	35.2	-29.8	1.12	46.01	-	-	-	-	178	276	H

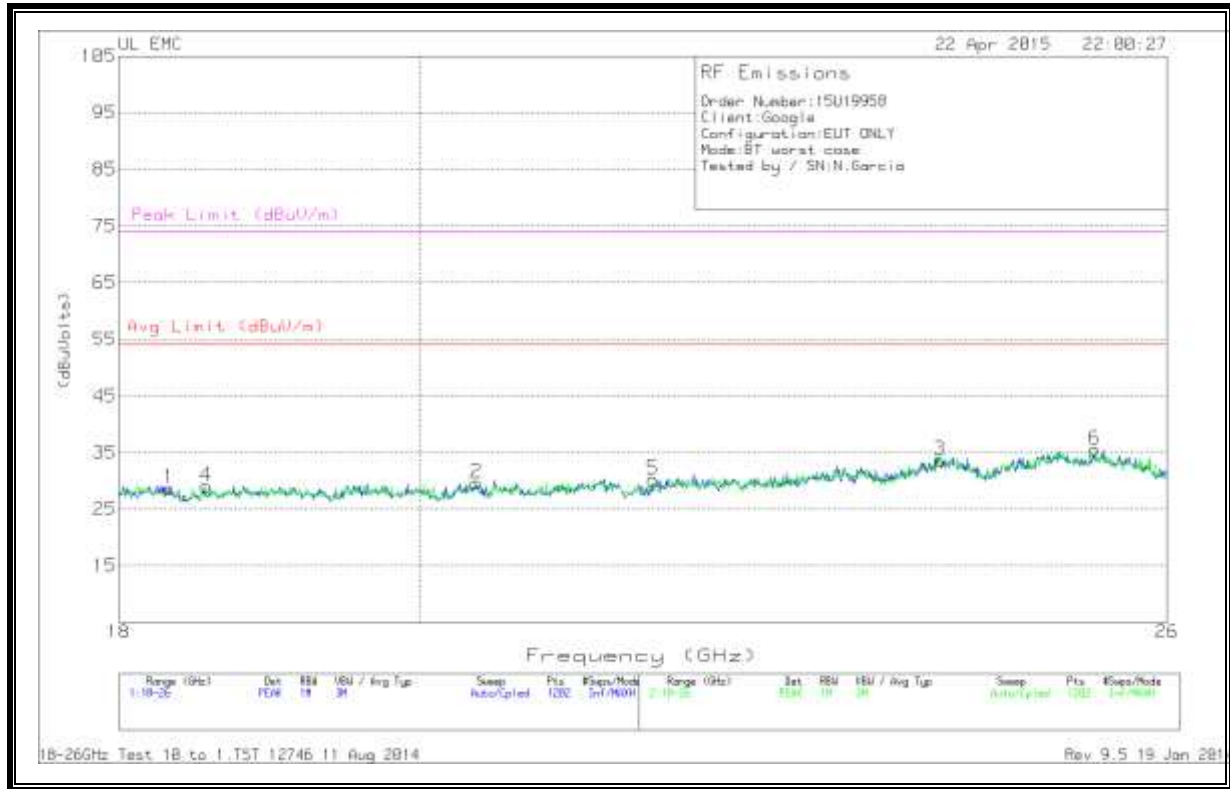
* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

PK3 - FHSS Method: Maximum Peak

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

8.1. WORST-CASE ABOVE 18 GHz

SPURIOUS EMISSIONS 18 TO 26 GHz (WORST-CASE CONFIGURATION)



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	18.32	41.37	PK	32.5	-25.2	-20	28.67	54	-25.33	74	-45.33
2	20.405	41.47	PK	32.9	-24.7	-20	29.67	54	-24.33	74	-44.33
3	24.008	43.17	PK	34.2	-23.7	-20	33.67	54	-20.33	74	-40.33
4	18.56	41	PK	32.6	-24.6	-20	29	54	-25	74	-45
5	21.71	41.37	PK	33.6	-24.8	-20	30.17	54	-23.83	74	-43.83
6	25.347	44.6	PK	34.5	-23.6	-20	35.5	54	-18.5	74	-38.5

PK - Peak detector

8.2. WORST-CASE BELOW 1 GHz

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

HORIZONTAL



VERTICAL



Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 74.455	48.6	PK	8.1	-30.7	26	40	-14	0-360	100	V
1	30.4675	43.26	PK	21	-31.3	32.96	40	-7.04	0-360	100	V
3	95.2375	53.18	PK	9	-30.5	31.68	43.52	-11.84	0-360	301	H
4	159.88	39.39	PK	12.3	-30	21.69	43.52	-21.83	0-360	98	H
8	187.505	38.97	PK	11.2	-29.8	20.37	43.52	-23.15	0-360	100	V
9	200.6	39.07	PK	12.4	-29.7	21.77	43.52	-21.75	0-360	99	H
10	212.8	40.57	PK	10.5	-29.6	21.47	43.52	-22.05	0-360	201	H
5	414.5	34.34	PK	16.1	-28.6	21.84	46.02	-24.18	0-360	99	H
6	517.7	36.62	PK	17.8	-28.2	26.22	46.02	-19.8	0-360	201	H
7	673.6	31.14	PK	19.8	-27.8	23.14	46.02	-22.88	0-360	100	V

* - indicates frequency in CFR 47, Part 15 and Industry Canada RSS-Restricted Band.

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

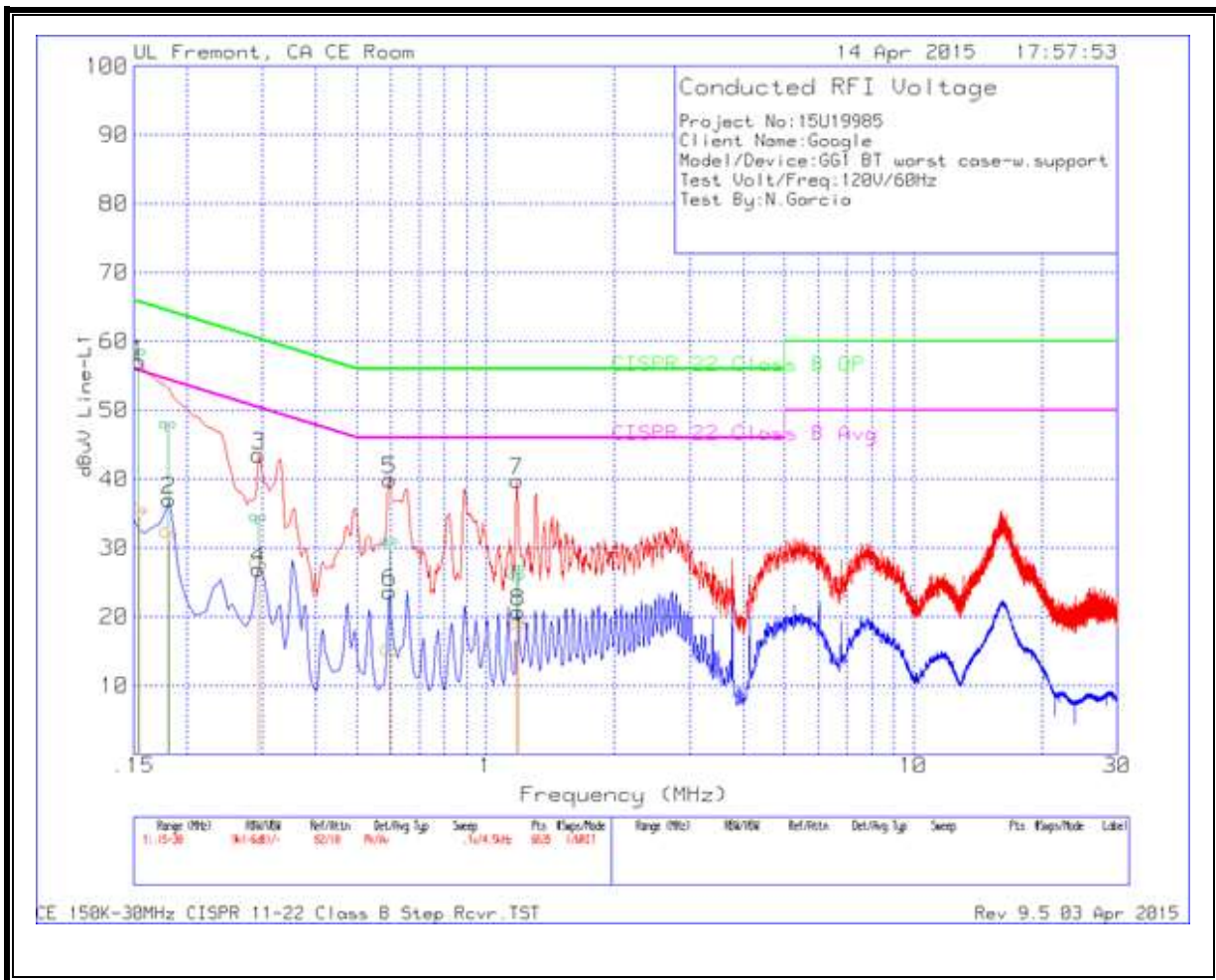
* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

RESULTS

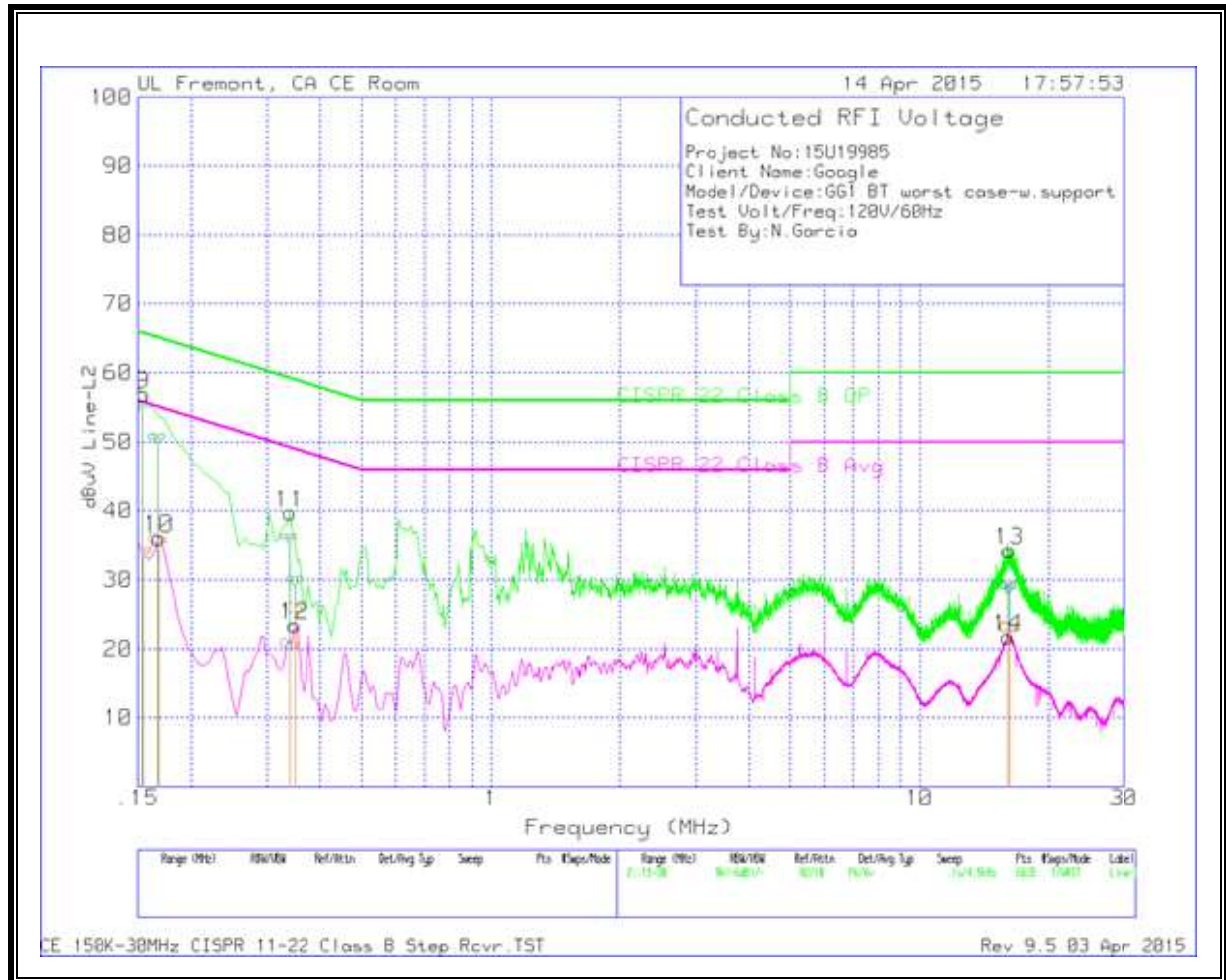
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz									
Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1	LC Cables 1&3	Corrected Reading dBuV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
.15338	33.05	Ca	1.4	0	34.45	-	-	55.81	-21.36
.15338	56.06	Qp	1.4	0	57.46	65.81	-8.35	-	-
.18038	29.85	Ca	1.1	0	30.95	-	-	54.47	-23.52
.18038	45.82	Qp	1.1	0	46.92	64.47	-17.55	-	-
.29378	25.89	Ca	.6	0	26.49	-	-	50.42	-23.93
.29378	32.81	Qp	.6	0	33.41	60.42	-27.01	-	-
.59663	13.57	Ca	.3	0	13.87	-	-	46	-32.13
.59663	29.68	Qp	.3	0	29.98	56	-26.02	-	-
1.18028	18.26	Ca	.2	0	18.46	-	-	46	-27.54
1.18028	24.79	Qp	.2	0	24.99	56	-31.01	-	-
1.19018	17.38	Ca	.2	.1	17.68	-	-	46	-28.32
1.19018	25.86	Qp	.2	.1	26.16	56	-29.84	-	-

Ca - CISPR average detection
Qp - Quasi-Peak detector

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz									
Frequency (MHz)	Meter Reading (dBμV)	Det	T24 IL L2	LC Cables 2&3	Corrected Reading dBμV	CISPR 22 Class B QP	Margin (dB)	CISPR 22 Class B Avg	Margin (dB)
.15338	31.9	Ca	1.5	0	33.4	-	-	55.81	-22.41
.15338	53.07	Qp	1.5	0	54.57	65.81	-11.24	-	-
.16688	33.51	Ca	1.3	0	34.81	-	-	55.11	-20.3
.16688	48.49	Qp	1.3	0	49.79	65.11	-15.32	-	-
.33788	19.14	Ca	.5	0	19.64	-	-	49.26	-29.62
.33788	34.8	Qp	.5	0	35.3	59.26	-23.96	-	-
.34913	24.28	Ca	.5	0	24.78	-	-	48.98	-24.2
.34913	28.7	Qp	.5	0	29.2	58.98	-29.78	-	-
16.2319	21.42	Ca	.3	.2	21.92	-	-	50	-28.08
16.2319	27.83	Qp	.3	.2	28.33	60	-31.67	-	-
16.1167	21.45	Ca	.3	.2	21.95	-	-	50	-28.05
16.1167	27.59	Qp	.3	.2	28.09	60	-31.91	-	-

Ca - CISPR average detection

Qp - Quasi-Peak detector