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

CERTIFICATION TEST REPORT

FOR

PORTABLE COMPUTER

MODEL NUMBER: A1707

FCC ID: BCGA1707
IC: 579C-A1707

REPORT NUMBER: 16U23800-E1V3

ISSUE DATE: OCTOBER 20, 2016

Prepared for
APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

Prepared by
UL VERIFICATION SERVICES INC.
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	9/28/2016	Initial Review	Chin Pang
V2	10/13/2016	Re-measured power to address TCB's question	Joe Vang
V3	10/20/2016	Added measurement method per TCB's request	Tina Chu

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 INFINITE LOOP
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: PORTABLE COMPUTER

MODEL: A1707

SERIAL NUMBER: C02S3002H79V

DATE TESTED: AUGUST 19, 2016 – OCTOBER 13, 2016

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
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SENIOR ENGINEER
UL VERIFICATION SERVICES INC.

Prepared By:

TRI PHAM
EMC ENGINEER
UL VERIFICATION SERVICES INC.

2. TEST METHODOLOGY

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

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, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance,1000 to 18000 MHz	4.32 dB
Radiated Disturbance,18000 to 26000 MHz	4.45 dB
Radiated Disturbance,26000 to 40000 MHz	5.24 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a portable computer with Bluetooth and WLAN Radios (AC 80 MHz Beam Forming).

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	11.51	14.16
2402 - 2480	DQPSK	10.51	11.25
2402 - 2480	Enhanced 8PSK	10.54	11.32

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Gain Chain 0 (dBi)
2.4	2.1

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was v234 c4096

5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was investigated with and without AC Charger, it was determined that the worst case was with AC Charger. Therefore, all final radiated testing was performed with AC Charger

Radiated emission on 30-1000MHz and power line conducted emissions was including headset, AC charger and the mode and channel with the highest output power.

Worst-case data rates were:

GFSK mode: DH5
8PSK mode: 3-DH5

DQPSK mode has been verified to have the lowest power.

For simultaneous transmission of multiple channels from the same antenna in the 2.4GHz and 5GHz bands, tests were conducted for various configurations having the highest power. No noticeable new emission was found.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC/ DC Adapter	Apple Inc.	A1540	N/A	N/A

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	Antenna	2	SMA	Un-Shielded	0.2	To Spectrum Analyzer
2	DC	1	Lightning	Un-Shielded	2	N/A

I/O CABLES (ABOVE 1G RADIATED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	Lightning	Un-Shielded	2	N/A

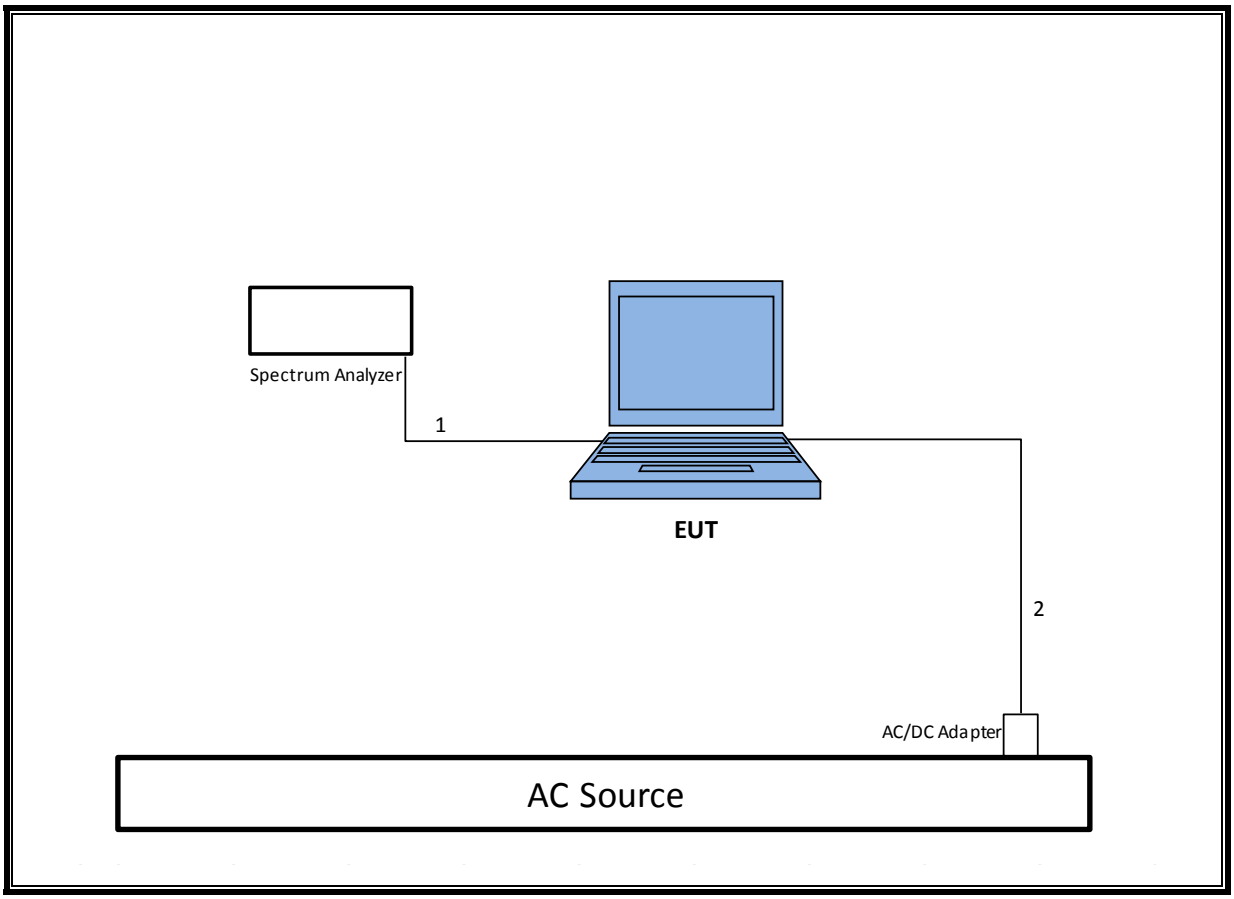
I/O CABLES (BELOW 1G RADIATED AND AC POWER CONDUCTED TEST)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC	1	Lightning	Un-Shielded	2	NA
2	Audio	1	Jack	Un-Shielded	0.5	NA

TEST SETUP- CONDUCTED PORT

The EUT was tested connected to spectrum analyzer via antenna port. Test software exercised the EUT.

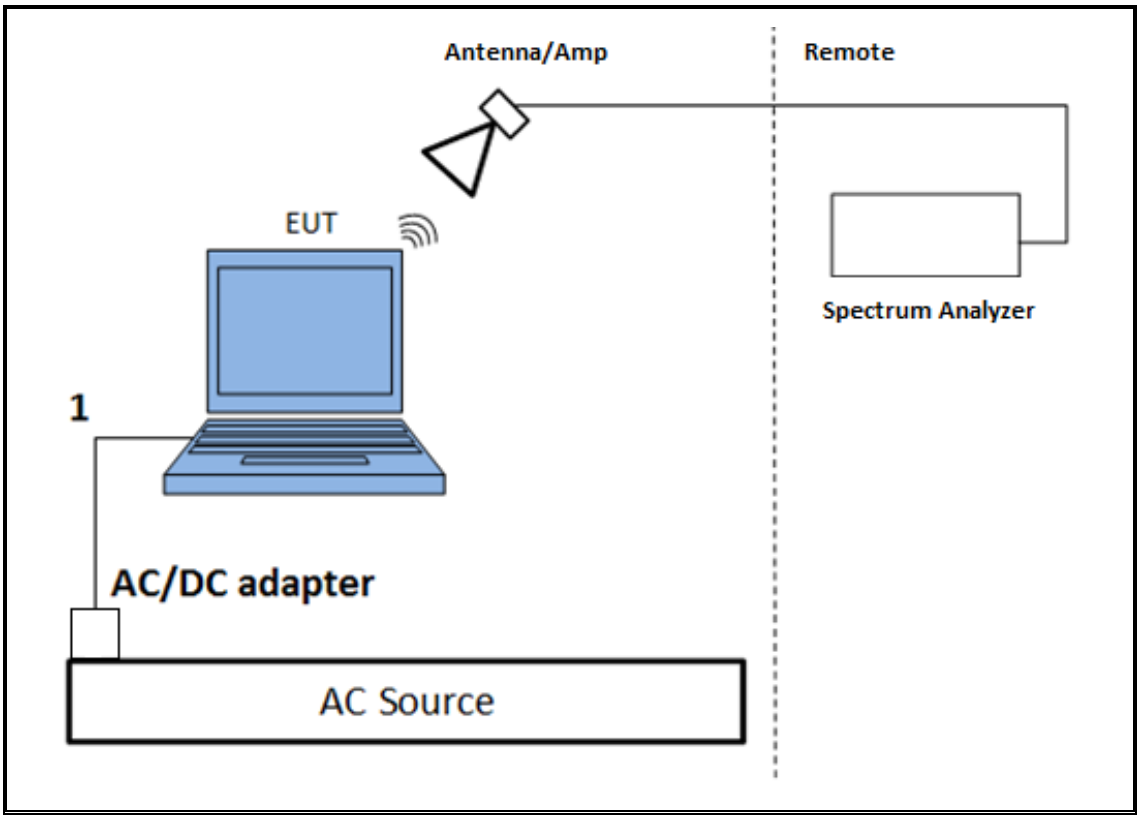
SETUP DIAGRAM



TEST SETUP- RADIATED- ABOVE 1 GHz

The EUT was powered by AC/DC adapter. Test software exercised the EUT.

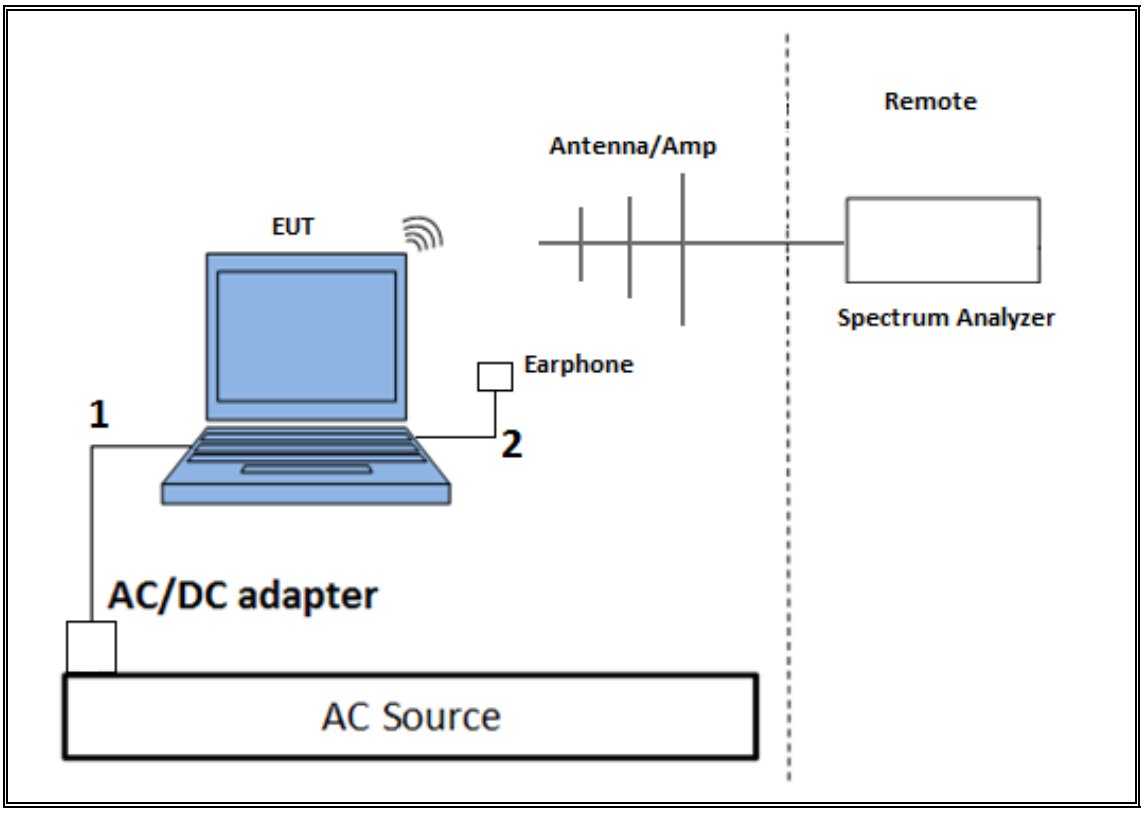
SETUP DIAGRAM



TEST SETUP- RADIATED- BELOW 1 GHz

The EUT was powered by AC/DC adapter and with earphone plugged in. Test software exercised the EUT.

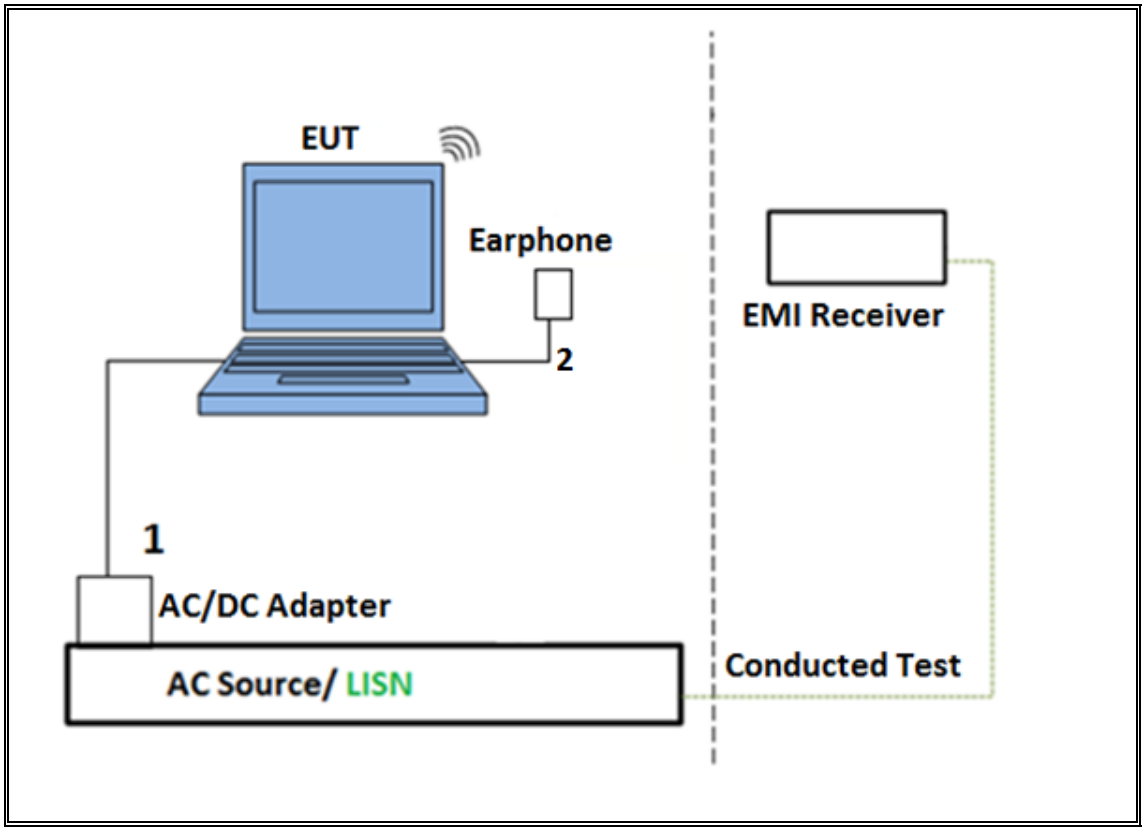
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED TESTS

The EUT was powered by AC/DC adapter and with earphone plugged in. Test software exercised the EUT.

SETUP DIAGRAM



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 Number**	**Cal Due**
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T120	4/5/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T122	1/29/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T173	6/17/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	T341	10/14/2016
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T862	4/18/2017
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	T899	5/26/2017
Amplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T491	5/31/2017
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T834	6/17/2017
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	T905	6/21/2017
Power Meter, P-series single channel	Agilent	N1911A	T1271	7/8/2017
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Agilent	N1921A	T1228	6/20/2017
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826	T447	6/16/2017
Amplifier, 1 to 26.5GHz, 23.5dB Gain minimum	Keysight	8449B	T402	7/5/2017
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	12/19/2016
LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	6/8/2017
**AC Source	Shaffner	NSG 1007	T134	9/11/2016
UL SOFTWARE				
* Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015	
* Conducted Software	UL	UL EMC	Ver 4.0, January 11, 2016	
* AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

Note: * indicates automation software version used in the compliance certification testing
** Equipment was used before calibration due date.

7. ANTENNA PORT TEST RESULTS

7.1. MEASUREMENT METHODS

20 dB and 99% BW: ANSI C63.10 Section 6.9.3

Hopping Frequency Separation: ANSI C63.10 Section 7.8.2

Number of Hopping Channels: ANSI C63.10 Section 7.8.3

Average Time of Occupancy: ANSI C63.10 Section 7.8.4

Output Power: ANSI C63.10 Section 7.8.5

Conducted Spurious Emissions: ANSI C63.10 Section 6.7

Radiated Spurious Emissions 30-1000MHz: ANSI C63.10 Section 6.3 and 6.5

Radiated Spurious Emissions above 1GHz: ANSI C63.10 Section 6.3 and 6.6

Band-edge: ANSI C63.10 Section 6.10

7.2. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

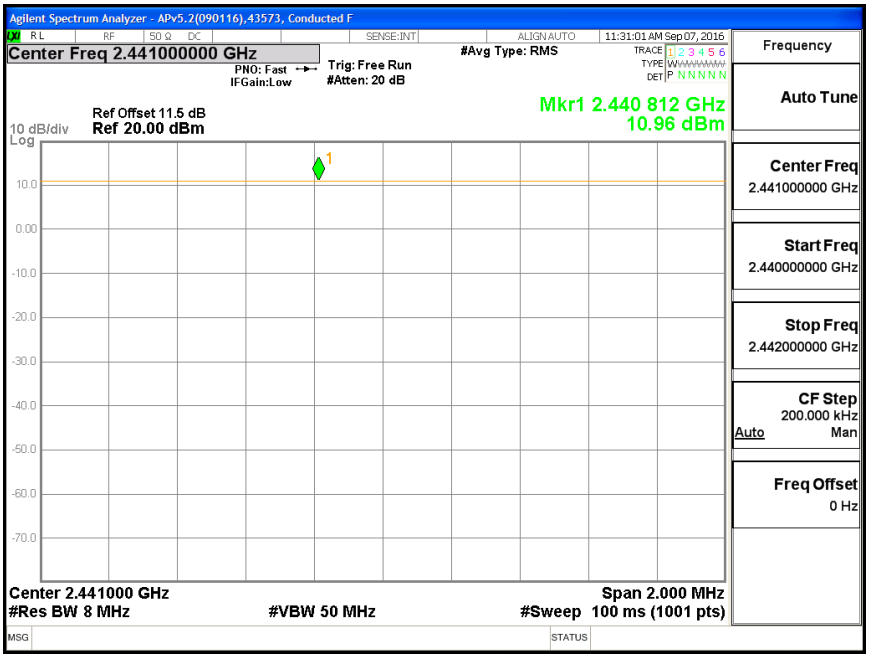
ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
Bluetooth GFSK	100.000	100.000	1.000	100.00%	0.00	0.010
Bluetooth 8PSK	100.000	100.000	1.000	100.00%	0.00	0.010

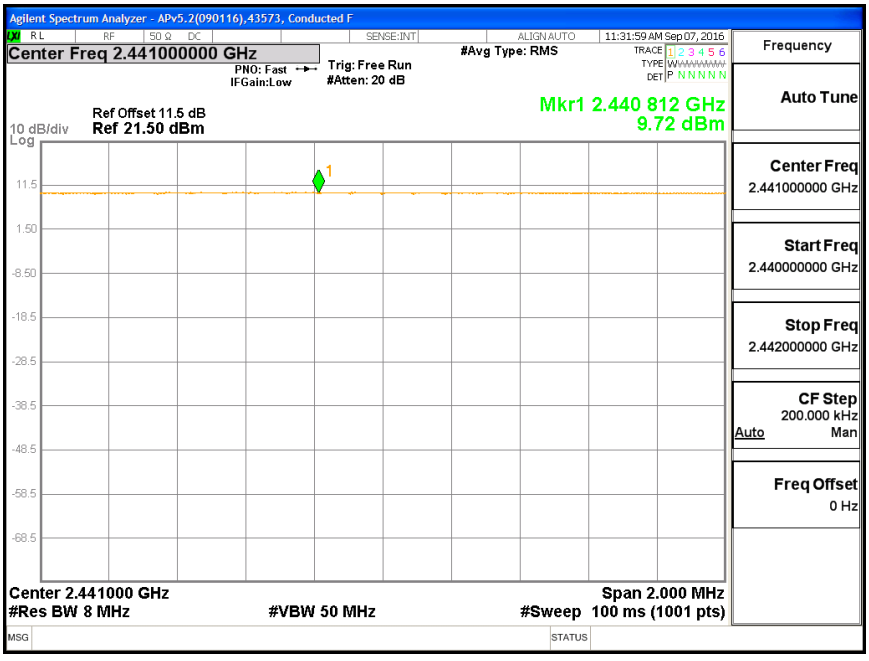
DUTY CYCLE PLOTS

HOPPING OFF

DUTY CYCLE GFSK MODE



DUTY CYCLE 8PSK MODE



7.3. BASIC DATA RATE GFSK MODULATION

7.3.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

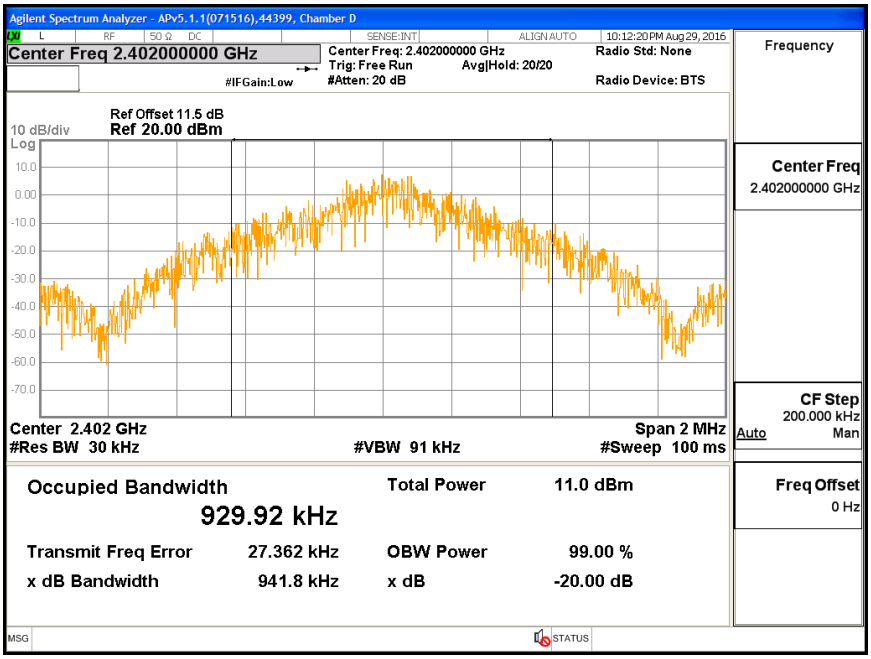
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

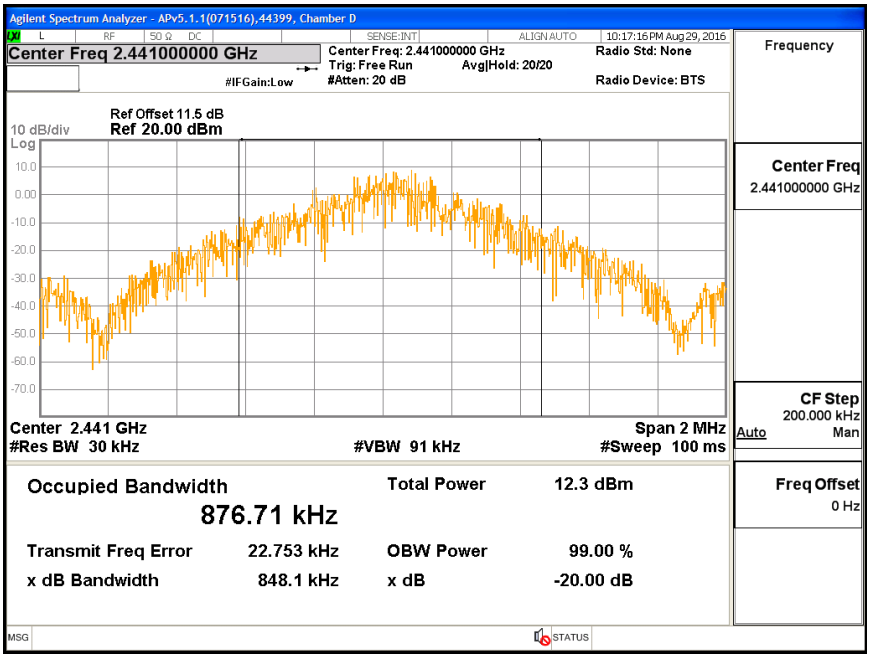
Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2402	941.8	929.92
Middle	2441	848.1	876.71
High	2480	957.1	911.14

20 dB AND 99% BANDWIDTH

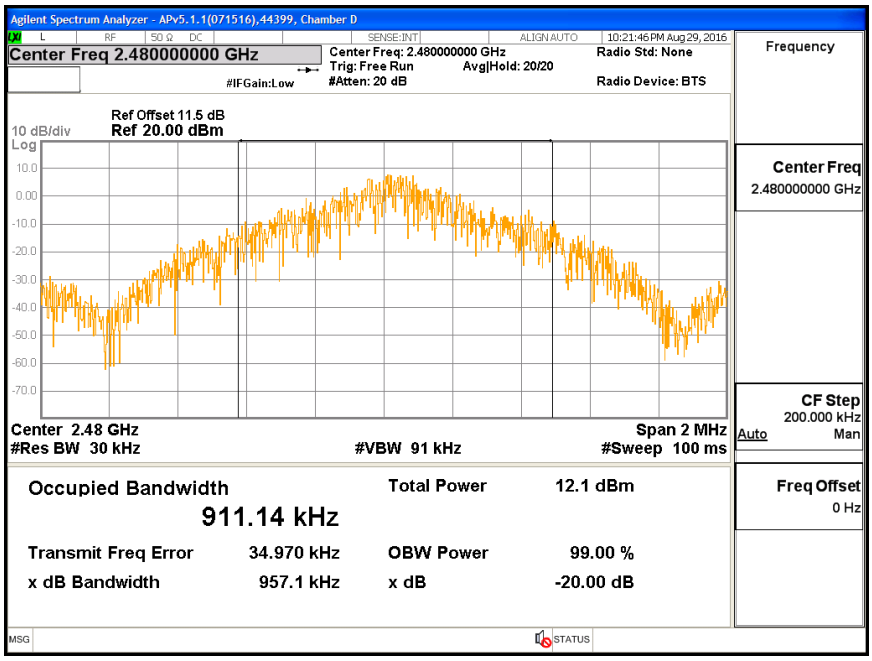
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.3.2. 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.

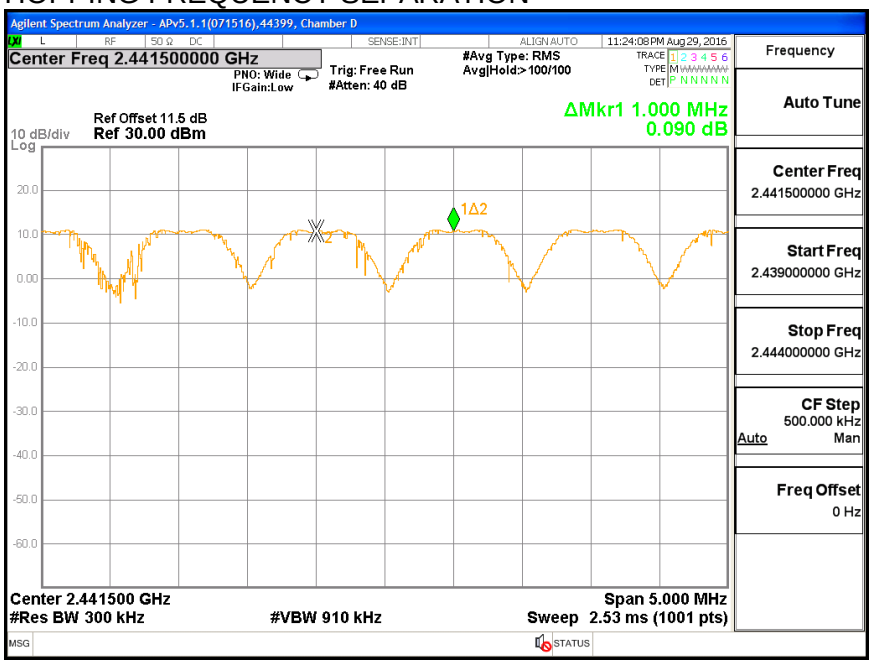
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION

HOPPING FREQUENCY SEPARATION



7.3.3. 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

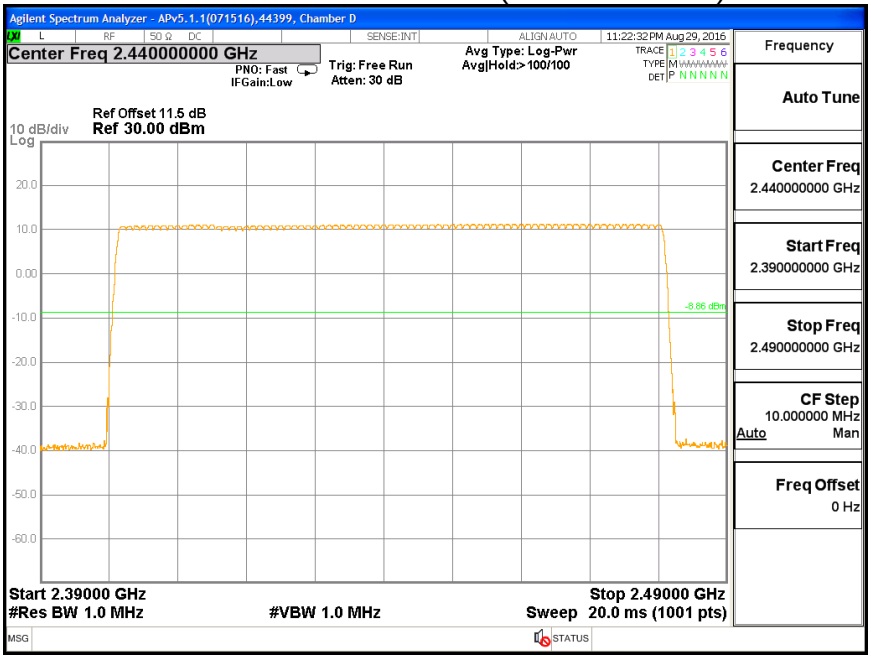
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

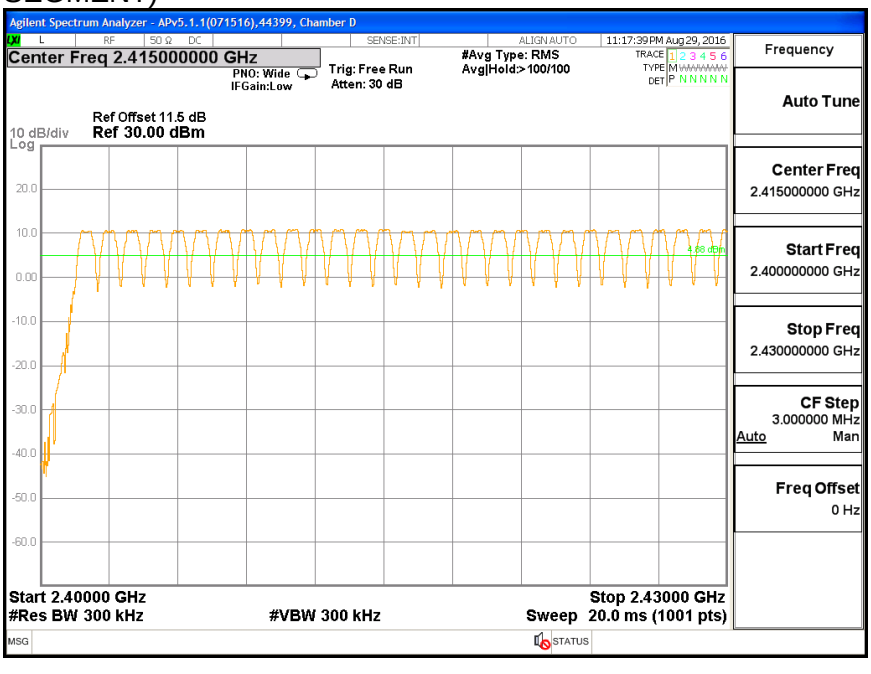
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS

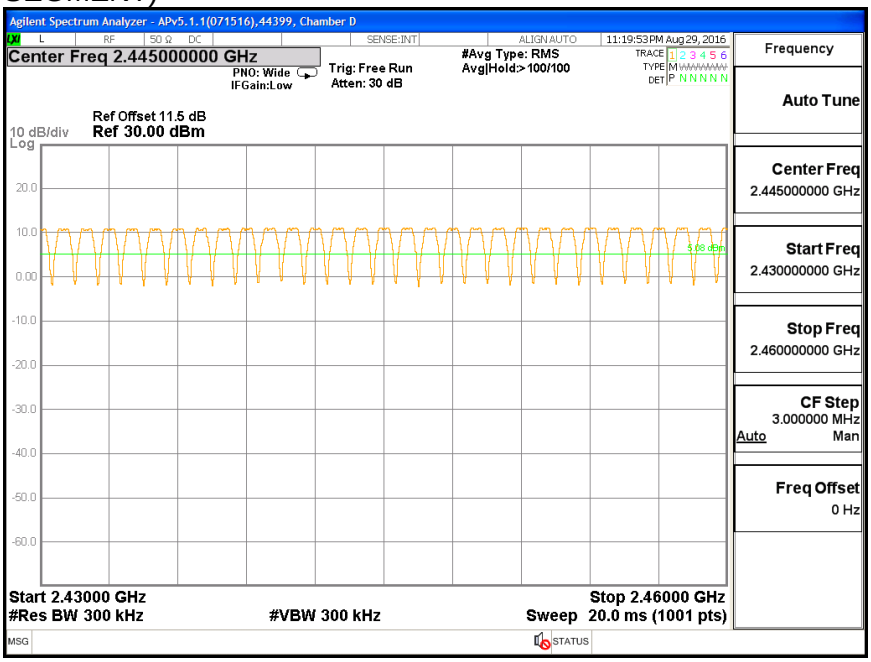
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



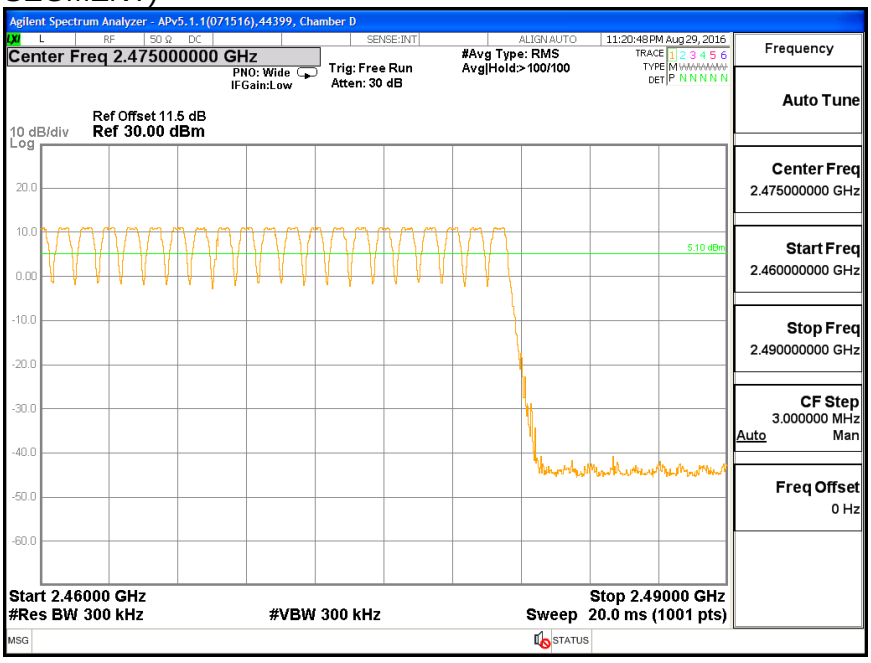
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



7.3.4. 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.

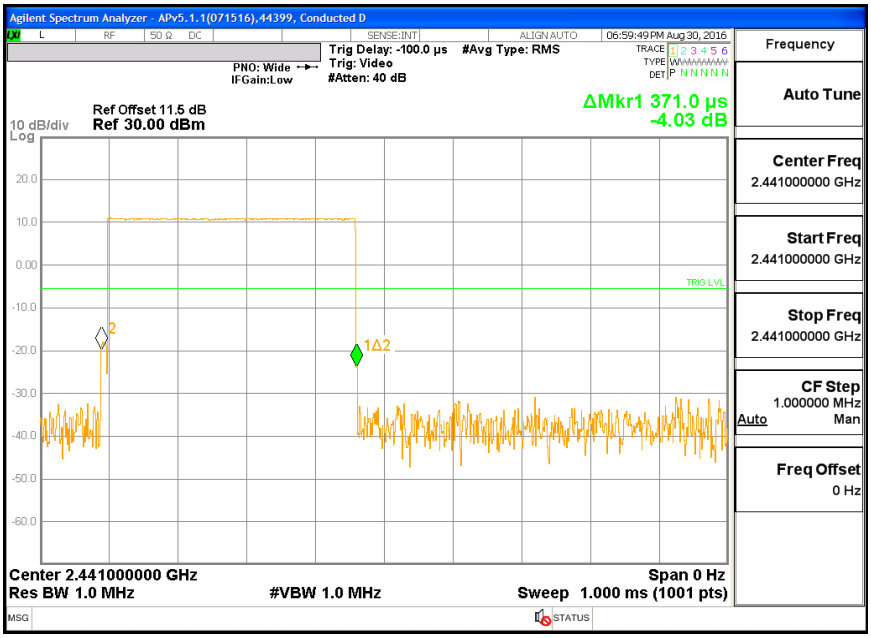
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

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	0.371	31	0.115	0.4	-0.285
DH3	1.648	16	0.264	0.4	-0.136
DH5	2.896	10	0.290	0.4	-0.110
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	0.371	7.75	0.029	0.4	-0.371
DH3	1.648	4	0.066	0.4	-0.334
DH5	2.896	2.5	0.072	0.4	-0.328

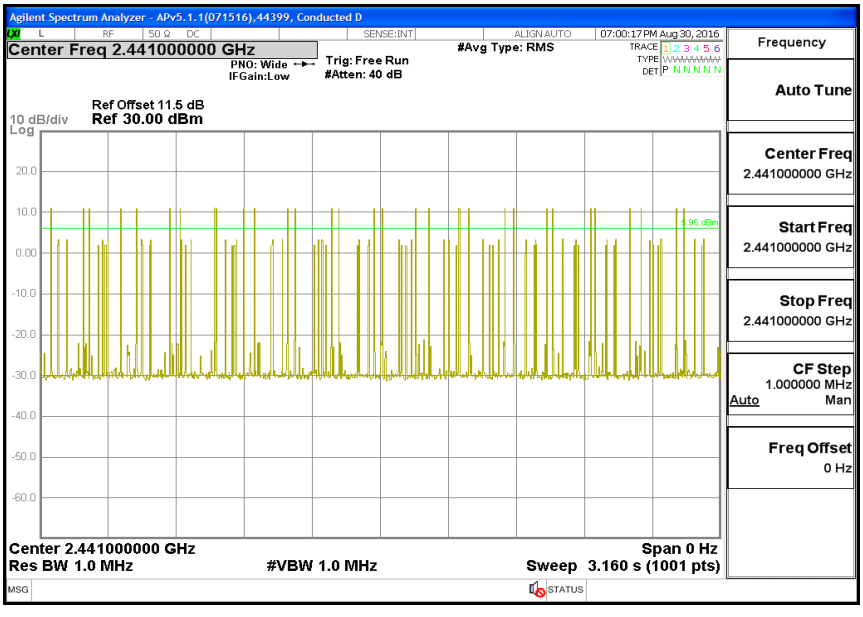
PULSE WIDTH - DH1

PULSE WIDTH – DH1

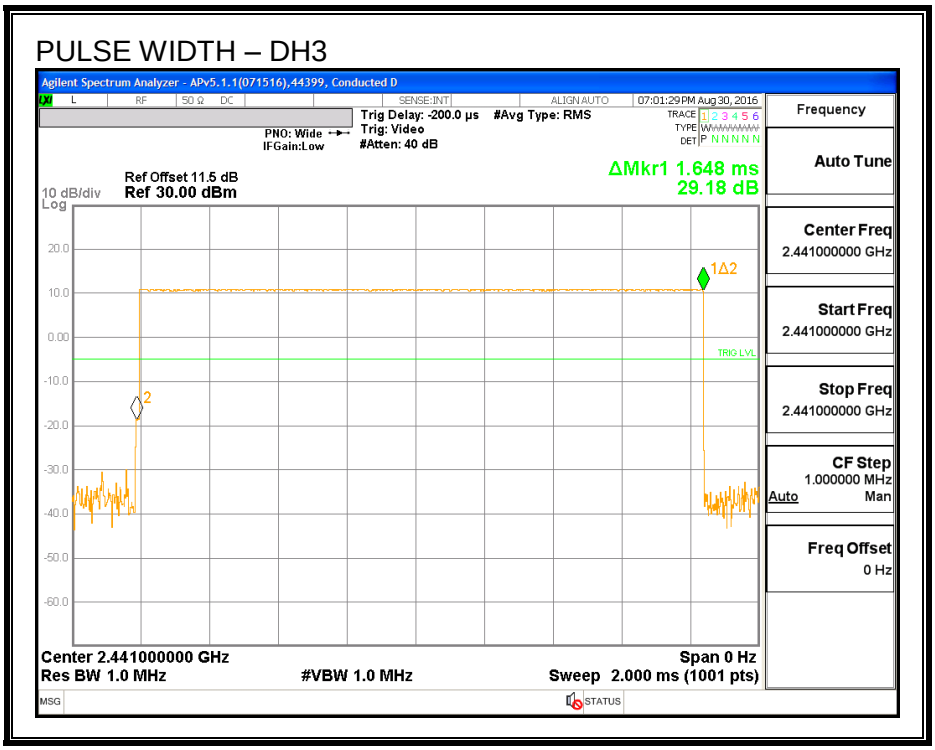


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1

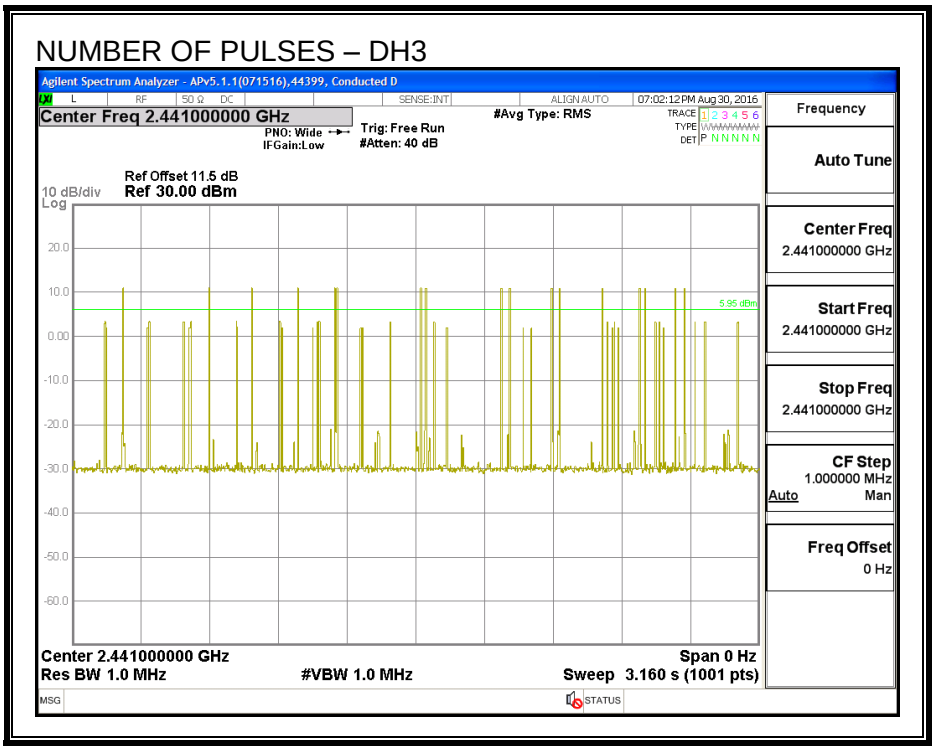
NUMBER OF PULSES – DH1



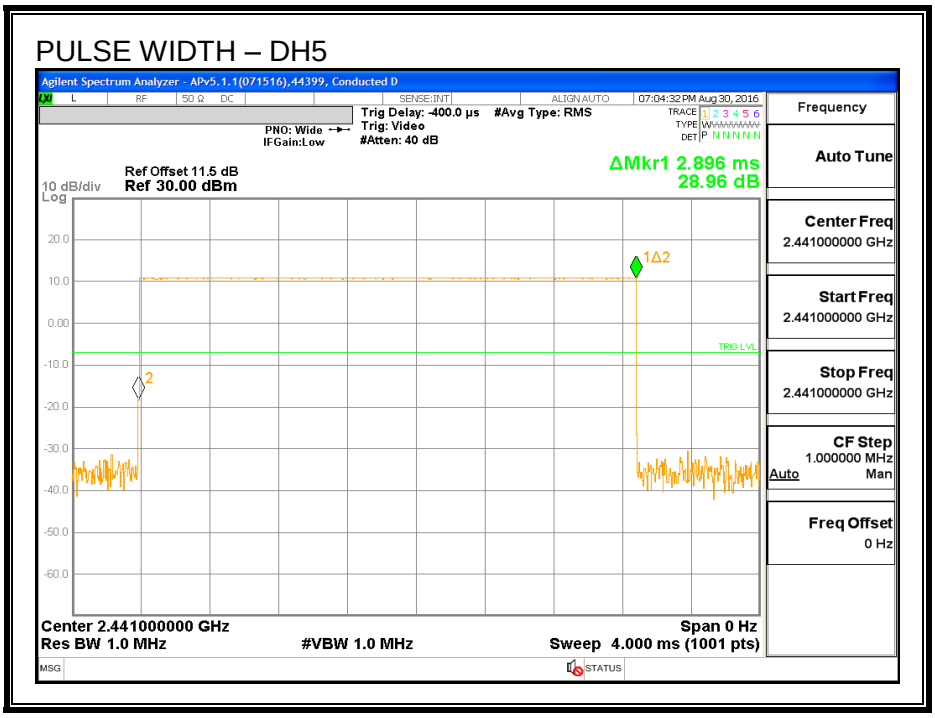
PULSE WIDTH – DH3



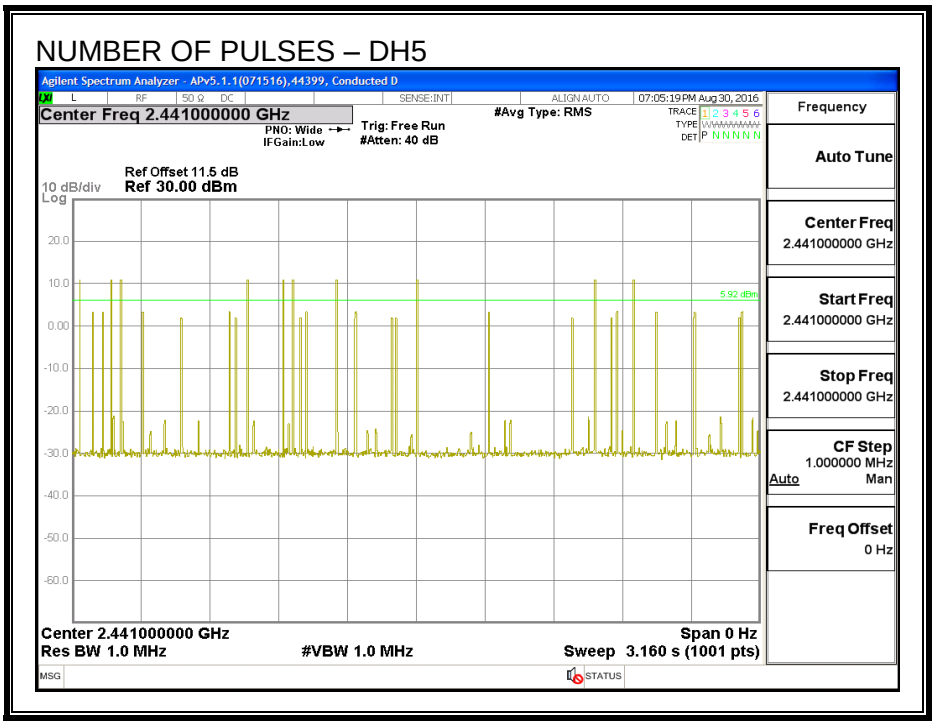
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5



7.3.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-247 (5.4) (2)

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

TEST PROCEDURE

The transmitter output is connected to a wideband peak power meter.

RESULTS

ID:	44399	Date:	8/30/16

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	11.20	30	-18.80
Middle	2441	11.51	30	-18.49
High	2480	11.32	30	-18.68

7.3.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

ID:	44399	Date:	8/30/16

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	11.14
Middle	2441	11.41
High	2480	11.30

7.3.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 (5.5)

Limit = -20 dBc

TEST PROCEDURE

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

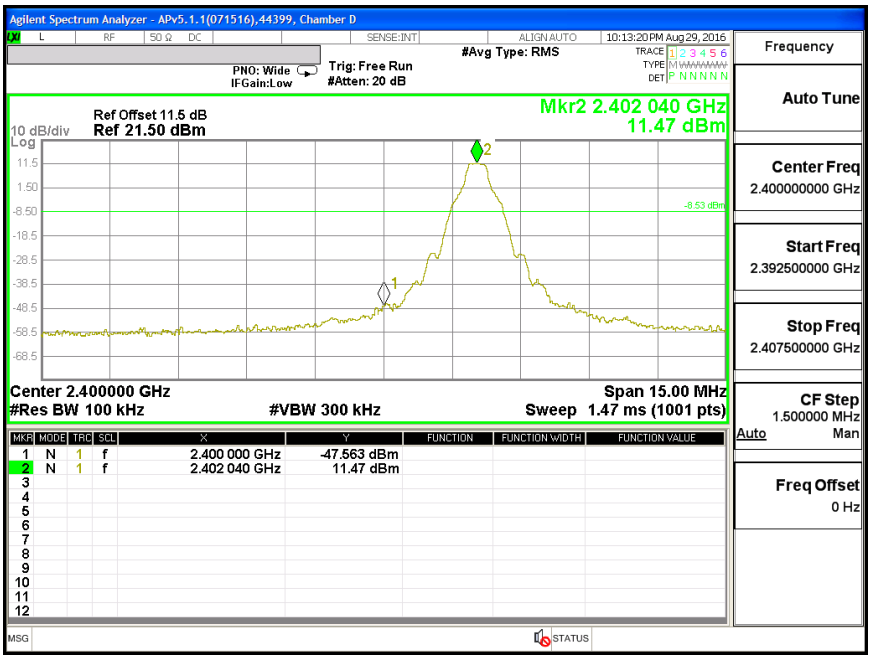
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

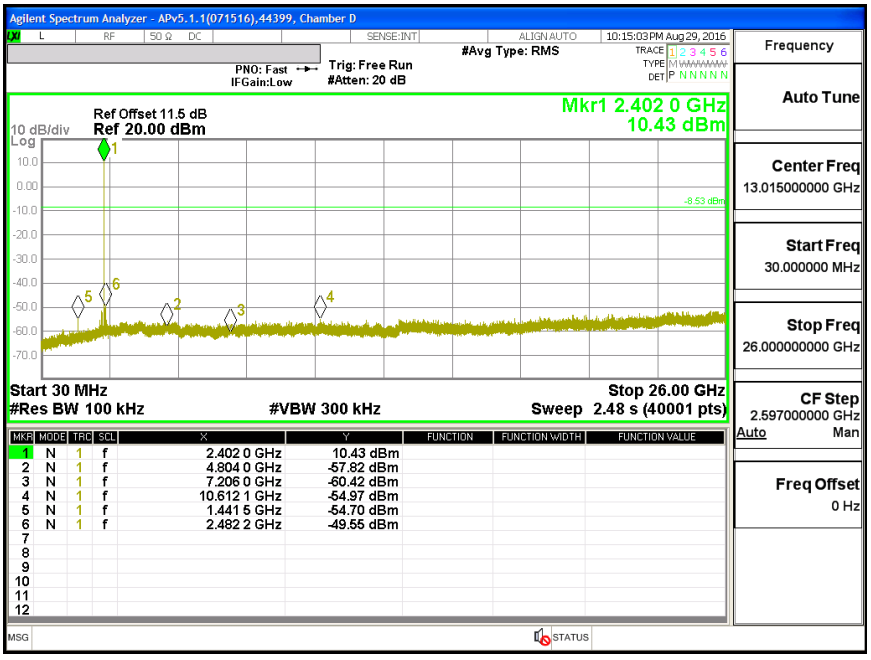
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

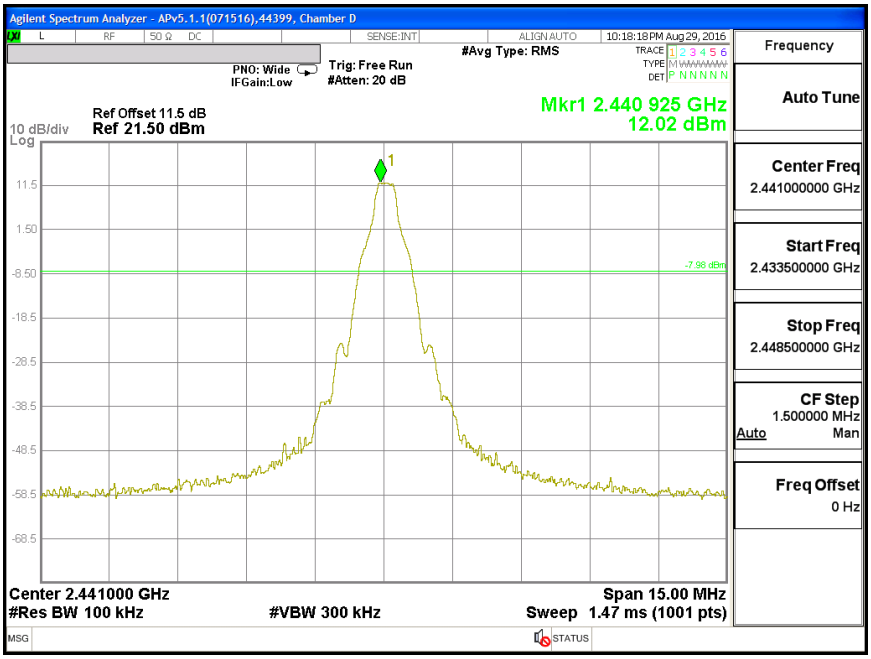


LOW CHANNEL SPURIOUS

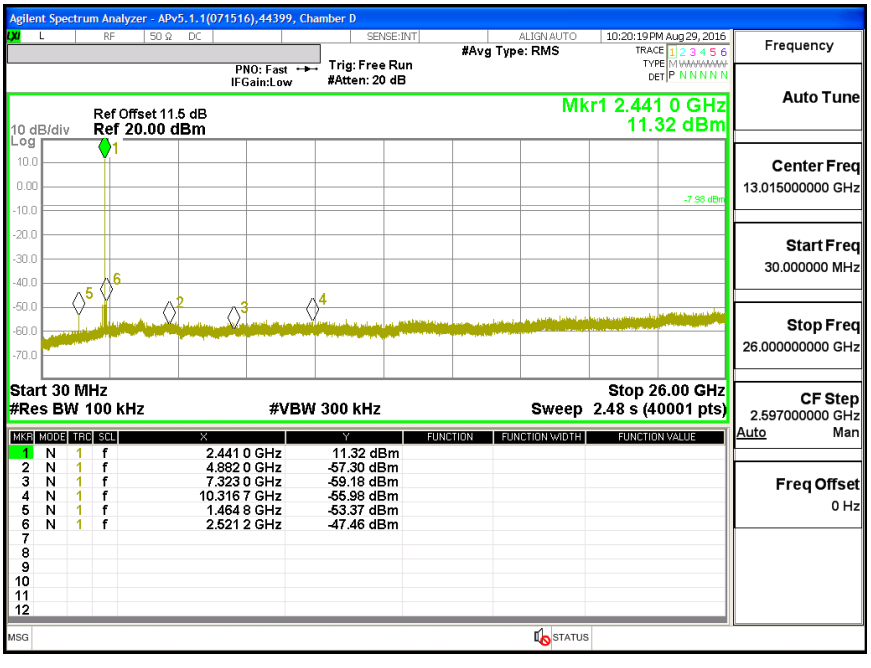


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL

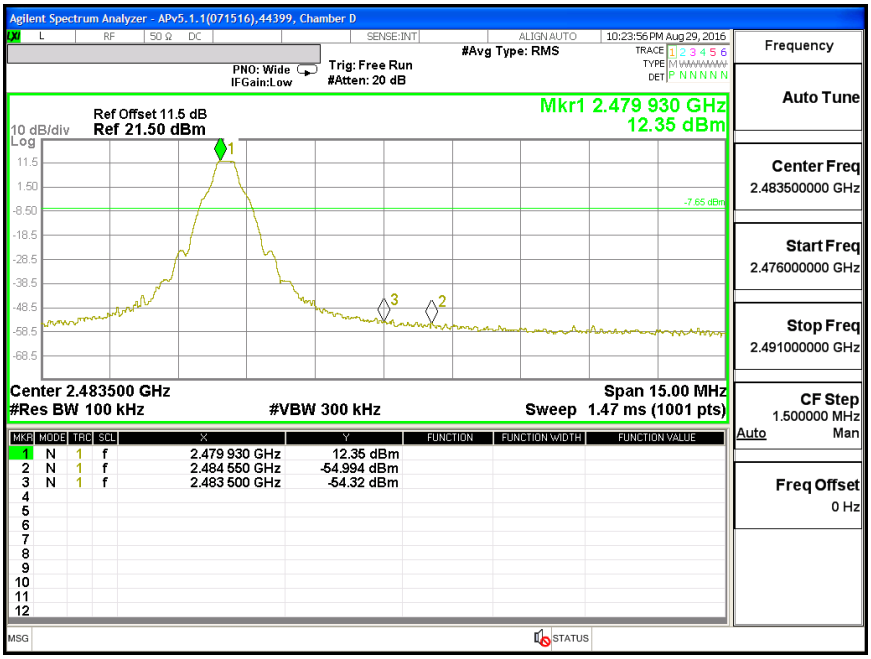


MID CHANNEL SPURIOUS

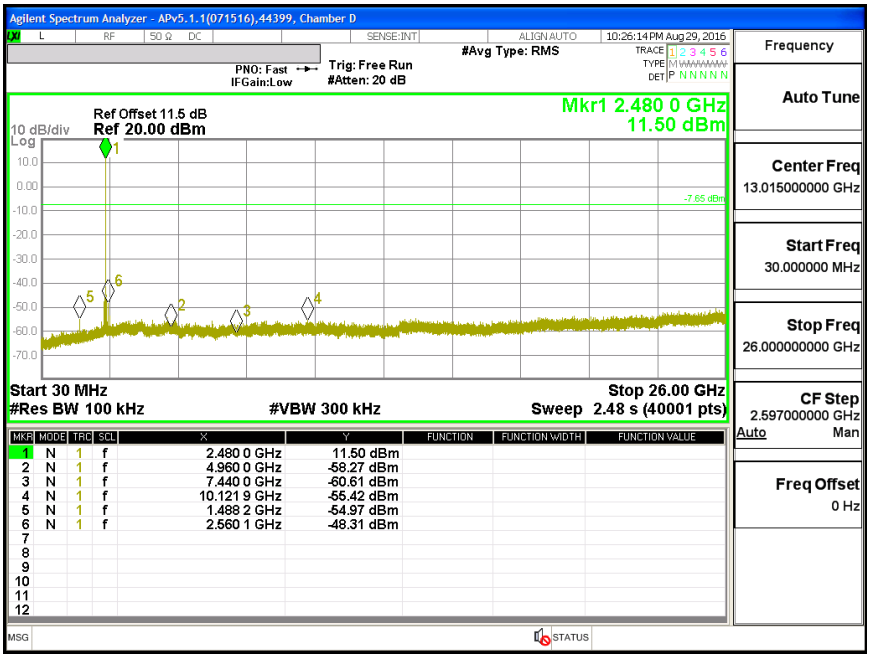


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

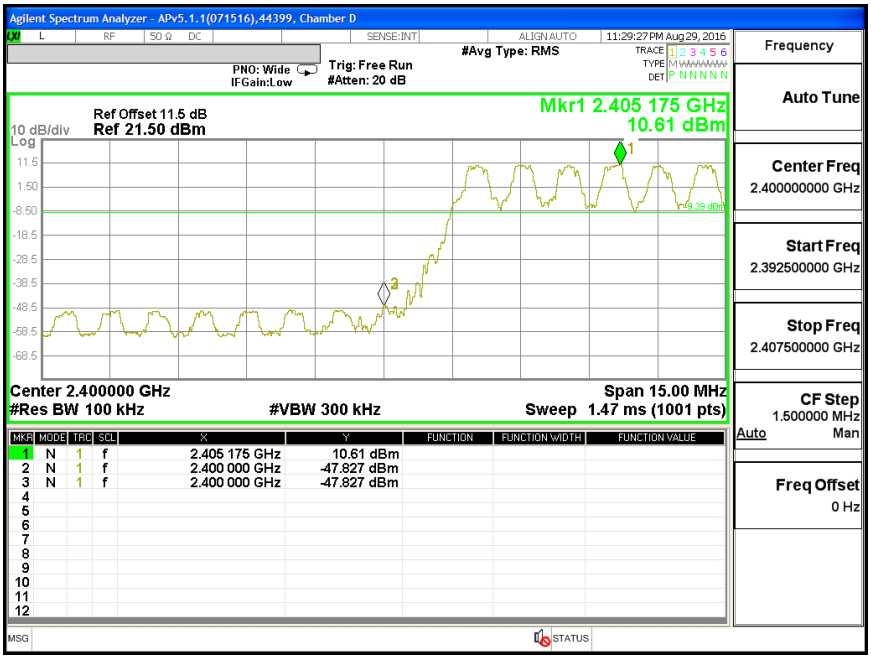


HIGH CHANNEL SPURIOUS

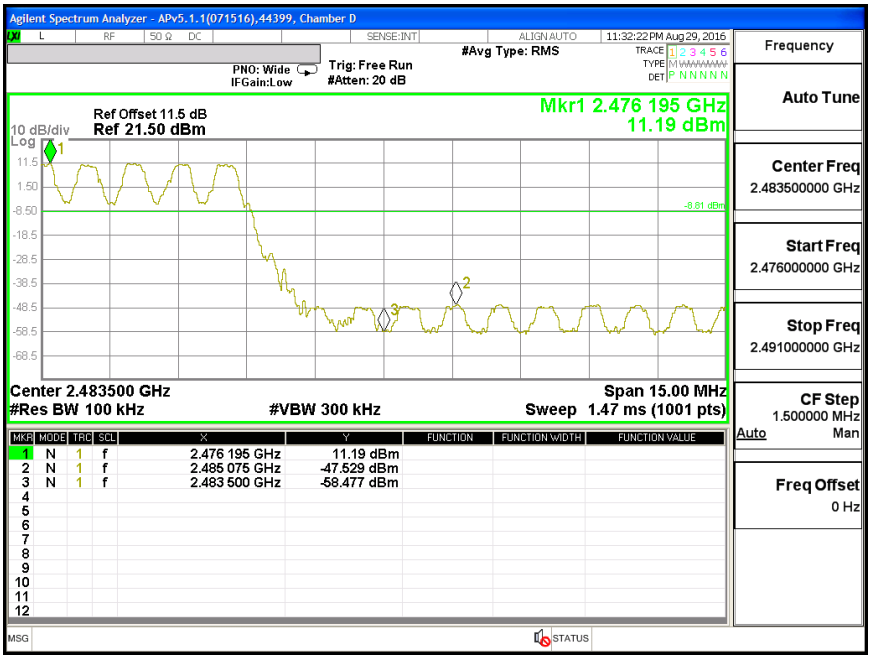


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

LOW BANDEDGE WITH HOPPING ON



HIGH BANDEDGE WITH HOPPING ON



7.4. ENHANCED DATA RATE QPSK MODULATION

7.4.1. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-247 (5.4) (2)

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

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

TEST PROCEDURE

The transmitter output is connected to a wideband peak power meter.

RESULTS

ID:	43573	Date:	8/30/16

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.44	21	-10.53
Middle	2441	10.51	21	-10.46
High	2480	10.13	21	-10.84

7.4.2. 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 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

ID:	43573	Date:	8/30/16

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.20
Middle	2441	8.38
High	2480	8.22

7.5. ENHANCED DATA RATE 8PSK MODULATION

7.5.1. 20 dB AND 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

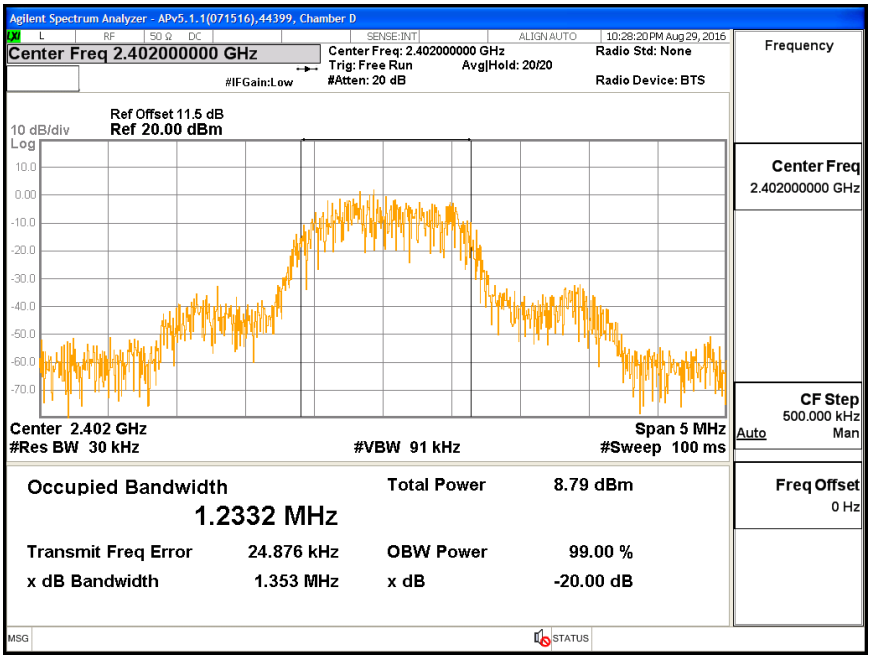
The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

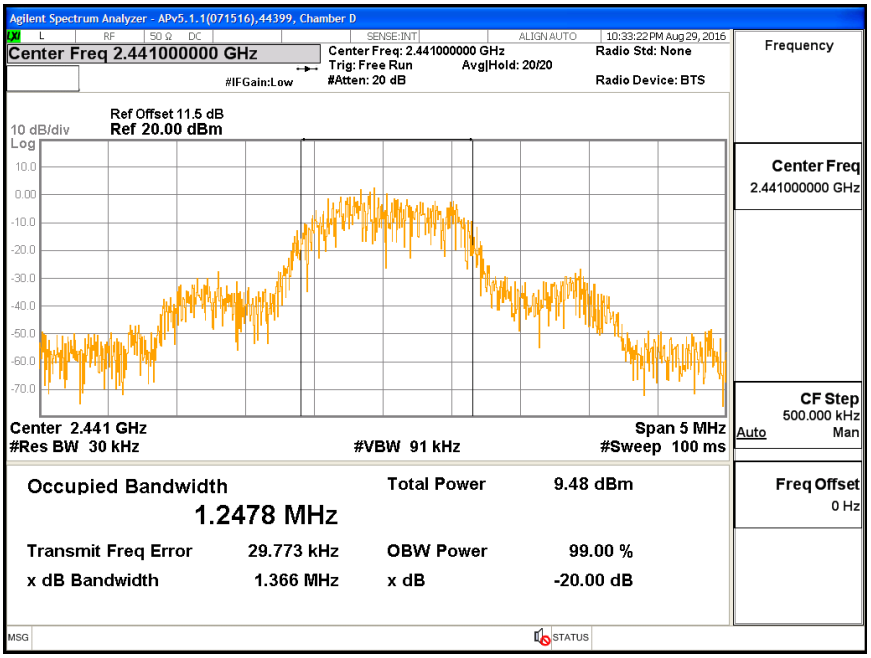
Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2402	1353.00	1233.20
Middle	2441	1366.00	1247.80
High	2480	1349.00	1283.90

20 dB AND 99% BANDWIDTH

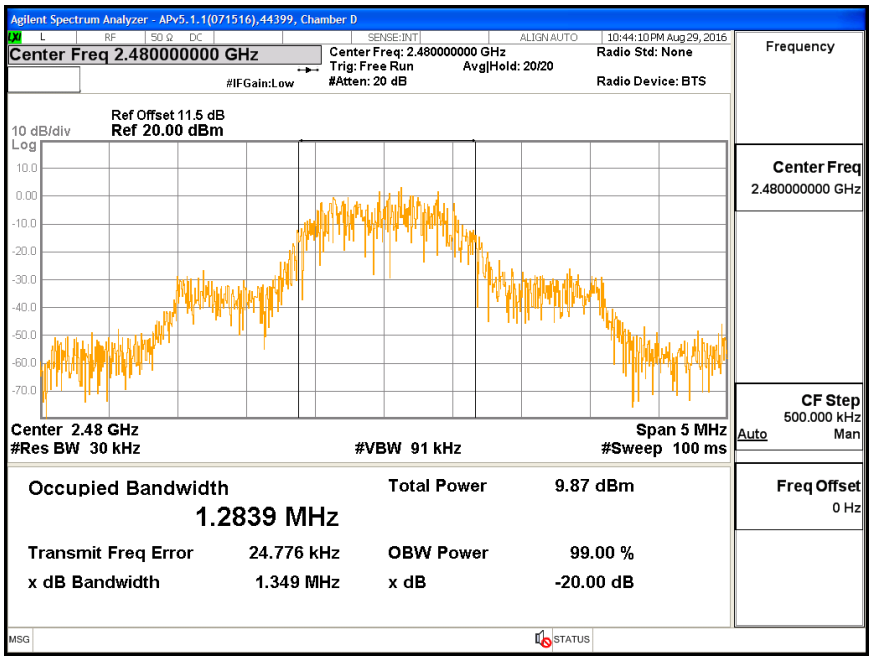
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.5.2. 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.

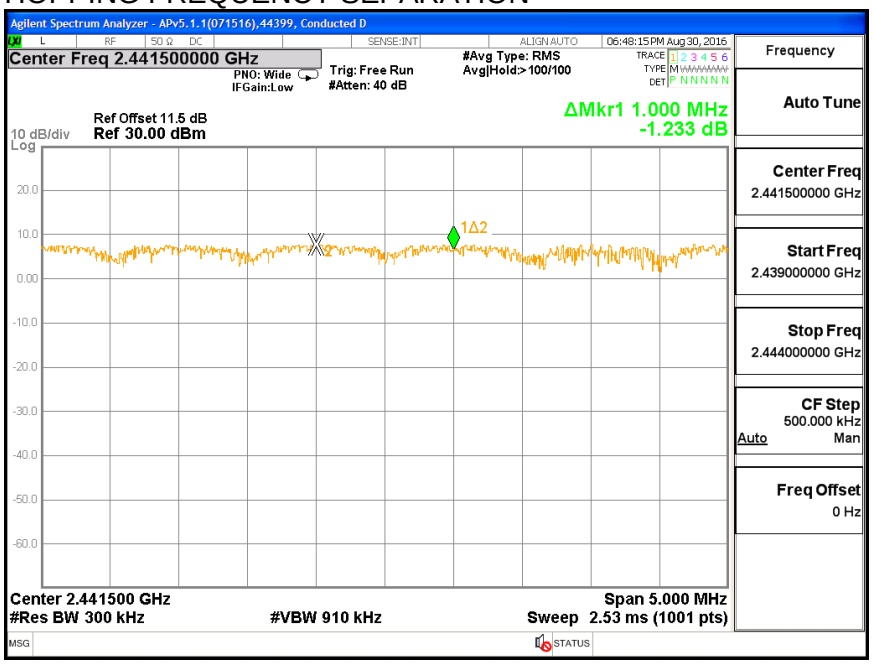
TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to 910 kHz. The sweep time is coupled.

RESULTS

HOPPING FREQUENCY SEPARATION

HOPPING FREQUENCY SEPARATION



7.5.3. 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

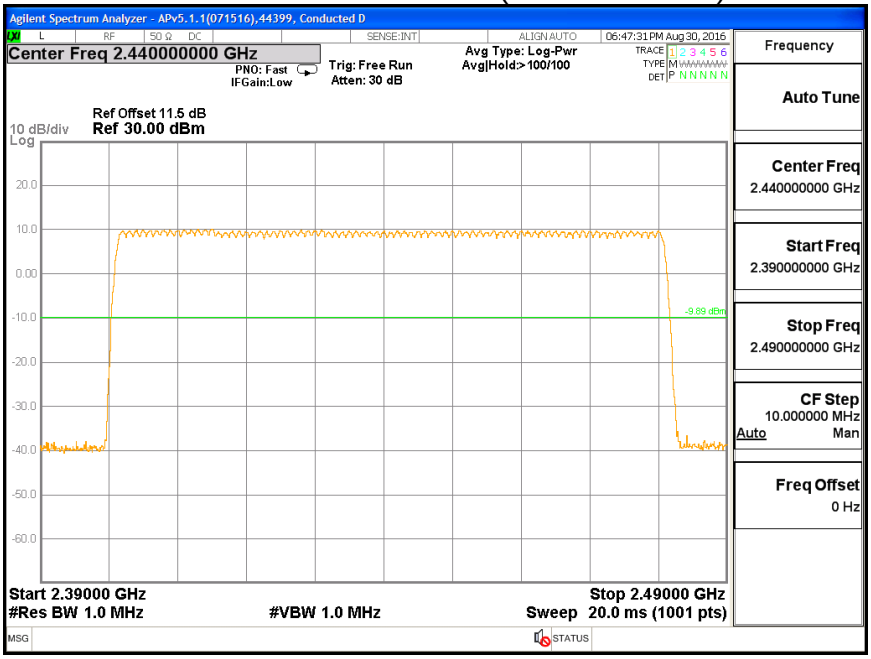
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

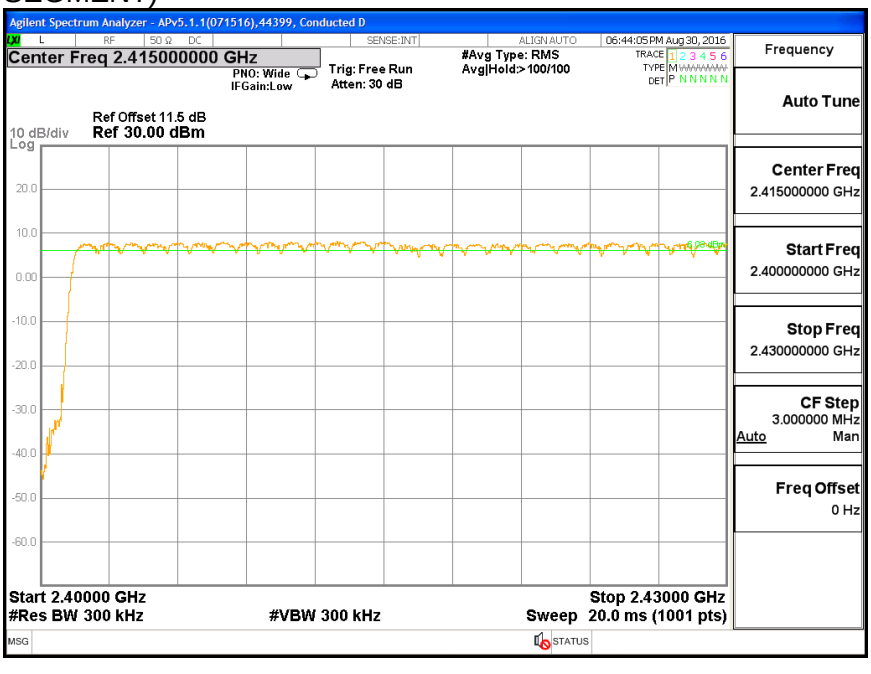
Normal Mode: 79 Channels observed.

NUMBER OF HOPPING CHANNELS

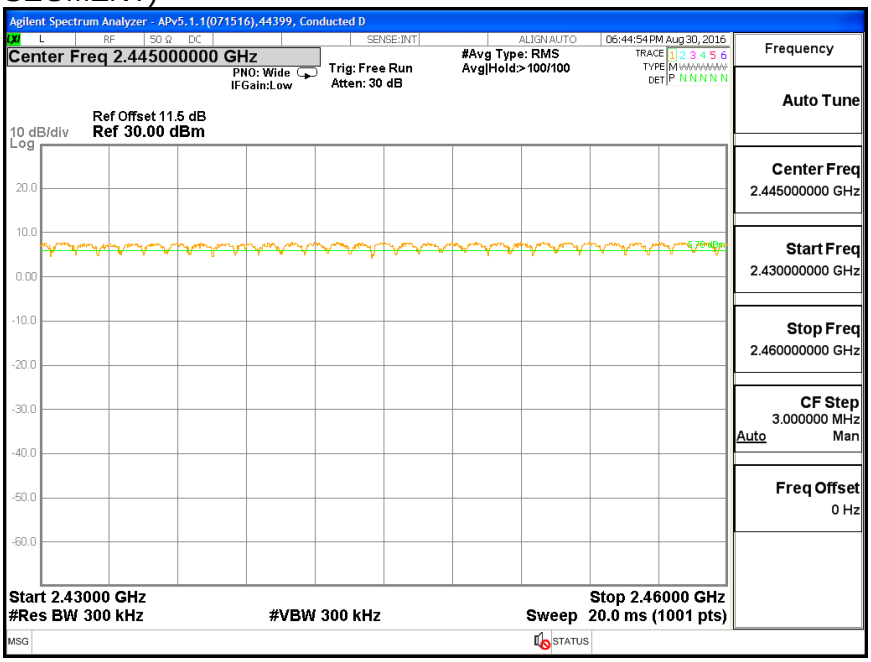
NUMBER OF HOPPING CHANNELS (100 MHZ SPAN)



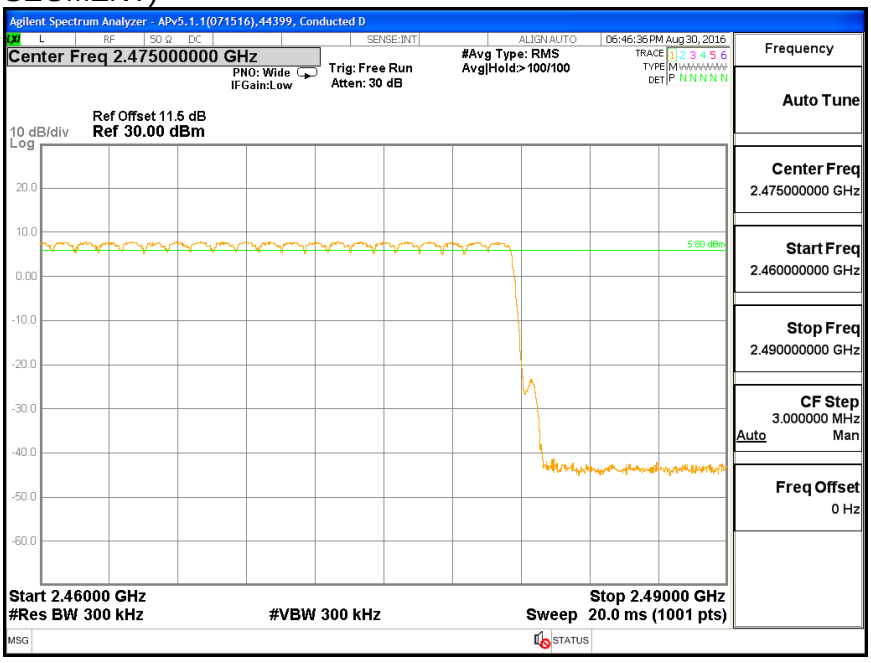
NUMBER OF HOPPING CHANNELS (30 MHZ SPAN, FIRST SEGMENT)



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



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



7.5.4. 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.

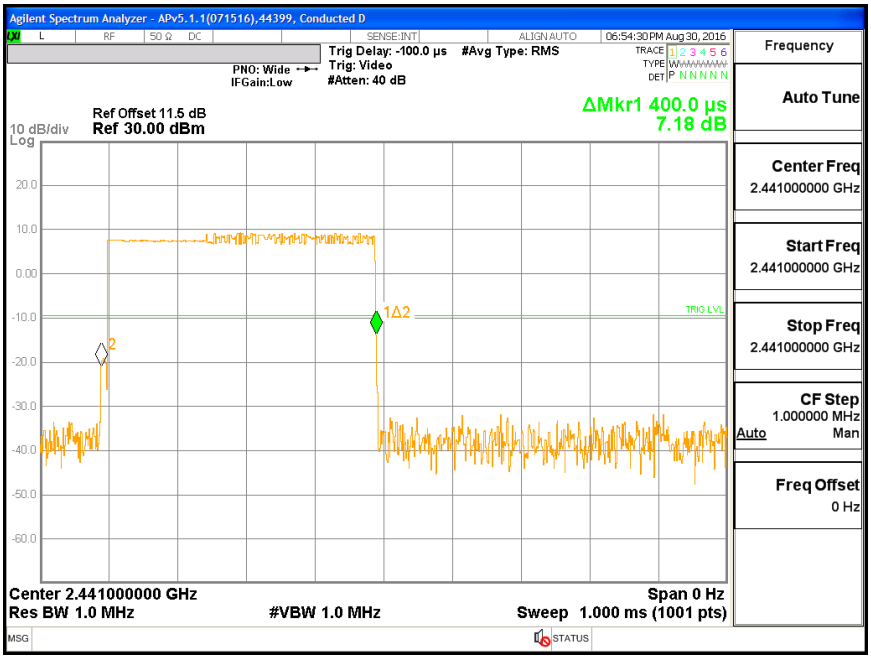
RESULTS

8PSK (EDR) Mode

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of (sec)	Limit (sec)	Margin (sec)
3DH1	0.4	32	0.128	0.4	-0.272
3DH3	1.652	16	0.264	0.4	-0.136
3DH5	2.896	9	0.261	0.4	-0.139

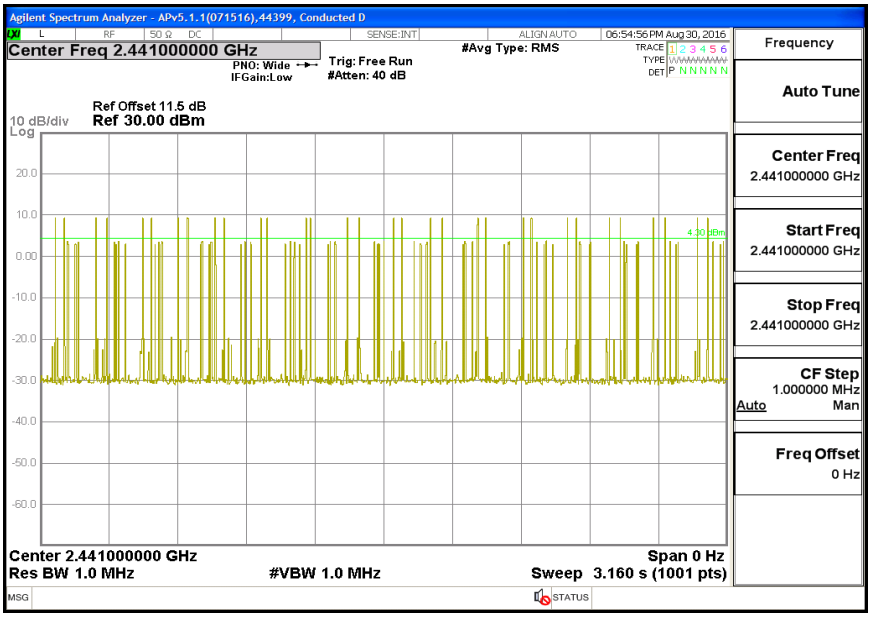
PULSE WIDTH - 3DH1

PULSE WIDTH – 3DH1



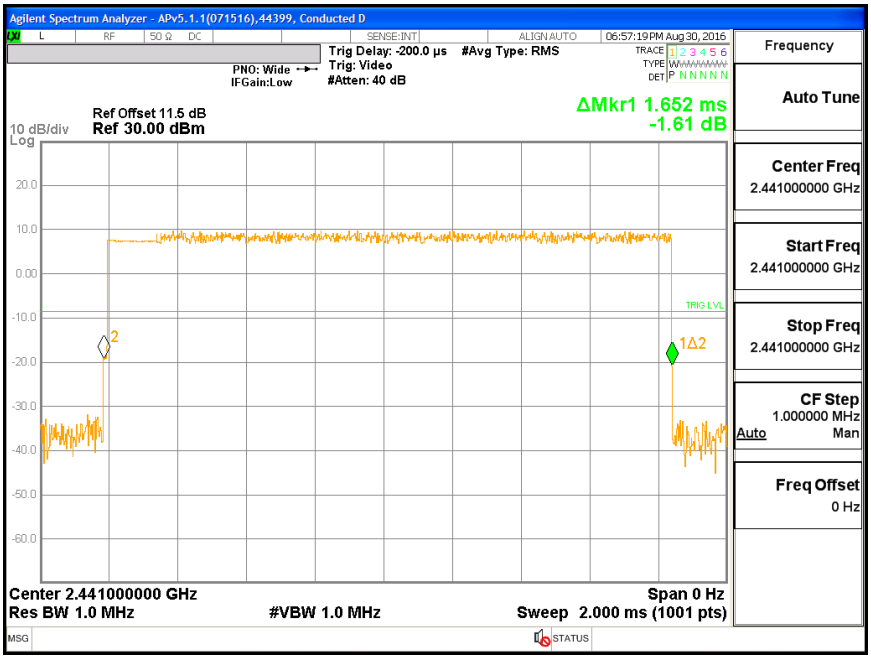
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1

NUMBER OF PULSES – 3DH1



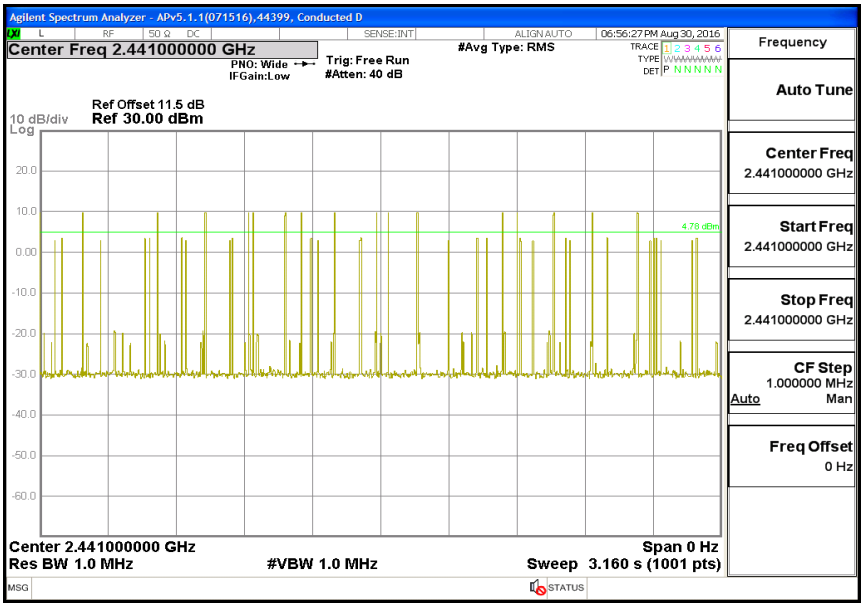
PULSE WIDTH – 3DH3

PULSE WIDTH – 3DH3



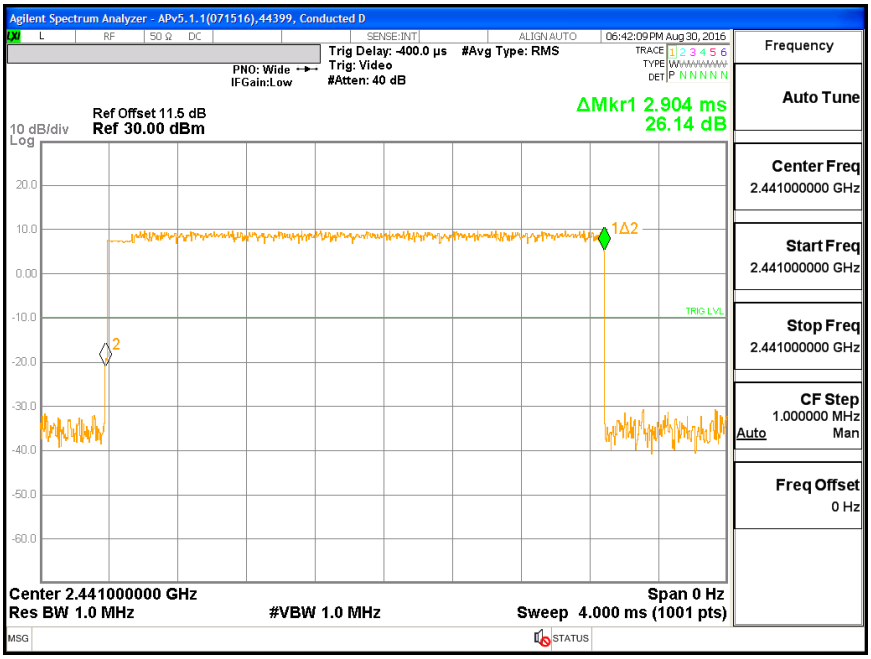
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3

NUMBER OF PULSES – DH3



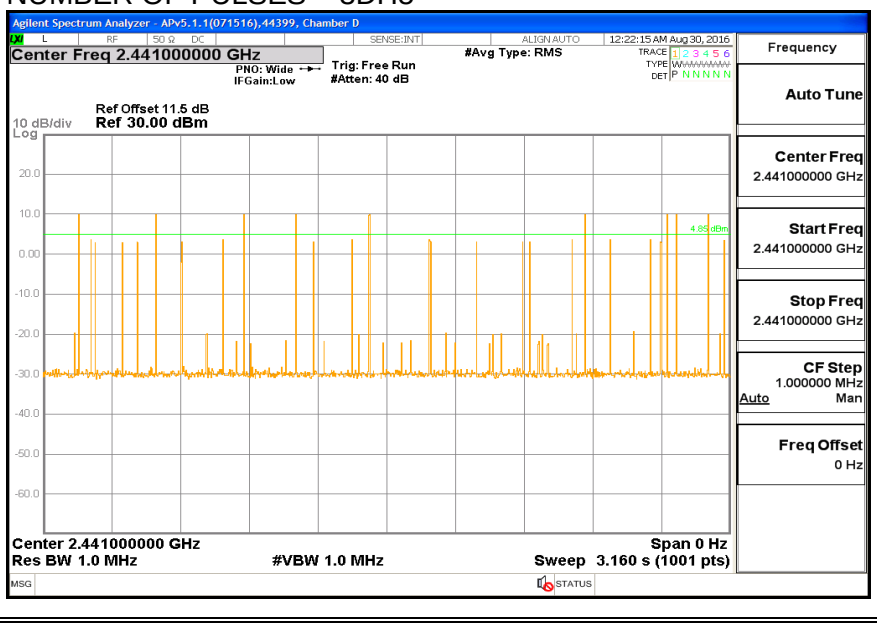
PULSE WIDTH – 3DH5

PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

NUMBER OF PULSES – 3DH5



7.5.5. OUTPUT POWER

LIMIT

§15.247 (b) (1)

RSS-247 (5.4) (2)

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

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

TEST PROCEDURE

The transmitter output is connected to a wideband peak and average power meter.

RESULTS

ID:	44399	Date:	8/30/16

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.50	21	-10.47
Middle	2441	10.54	21	-10.43
High	2480	10.16	21	-10.81

7.5.6. AVERAGE POWER

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

ID:	44399	Date:	8/30/16

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.23
Middle	2441	8.42
High	2480	8.25

7.5.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-247 (5.5)

Limit = -20 dBc

TEST PROCEDURE

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

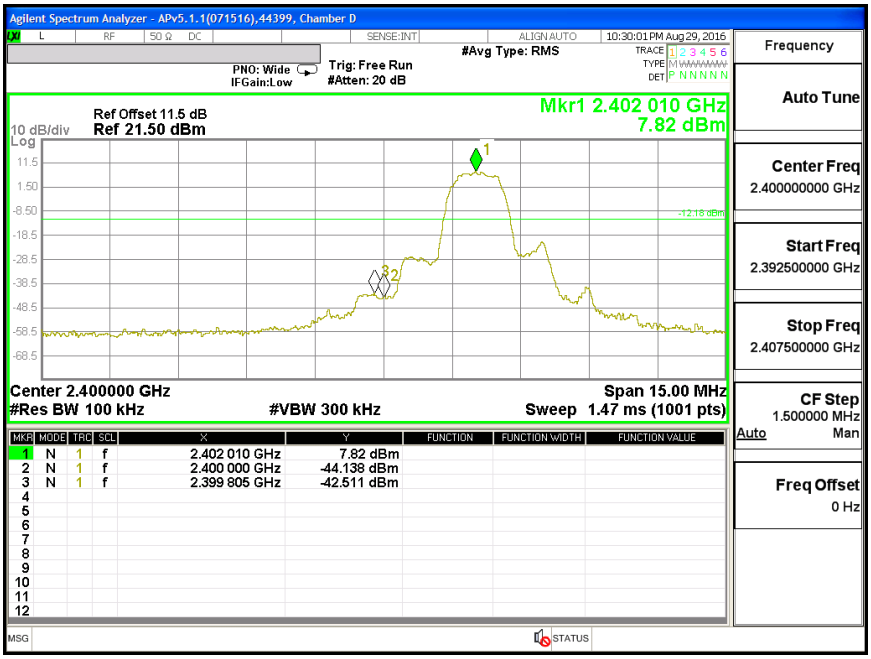
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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

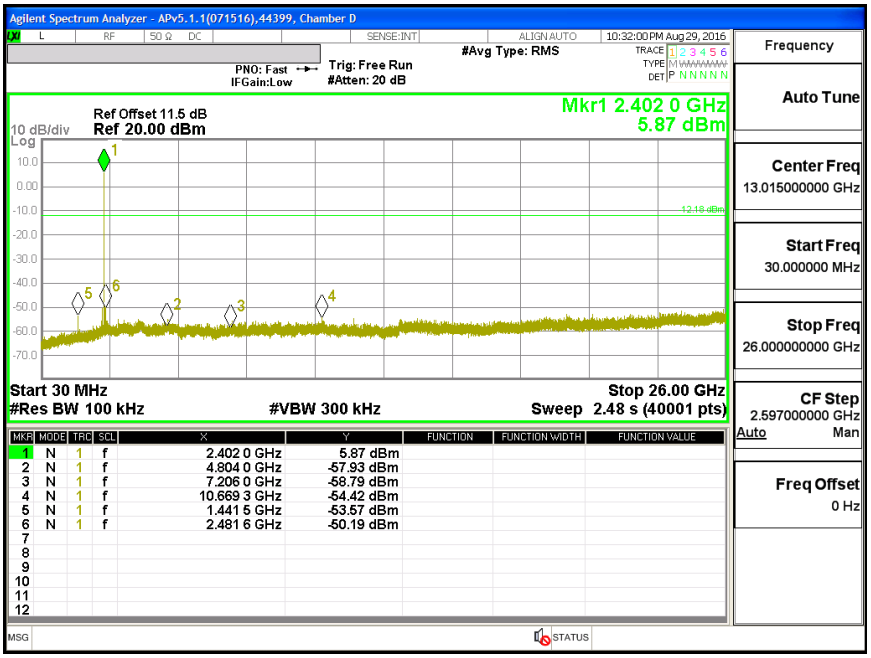
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CHANNEL BANDEDGE

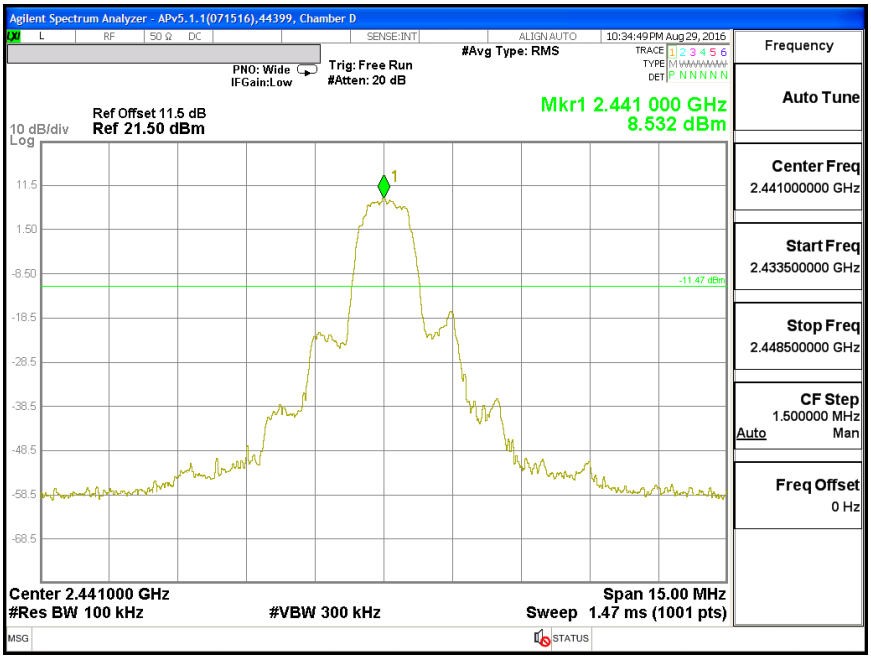


LOW CHANNEL SPURIOUS

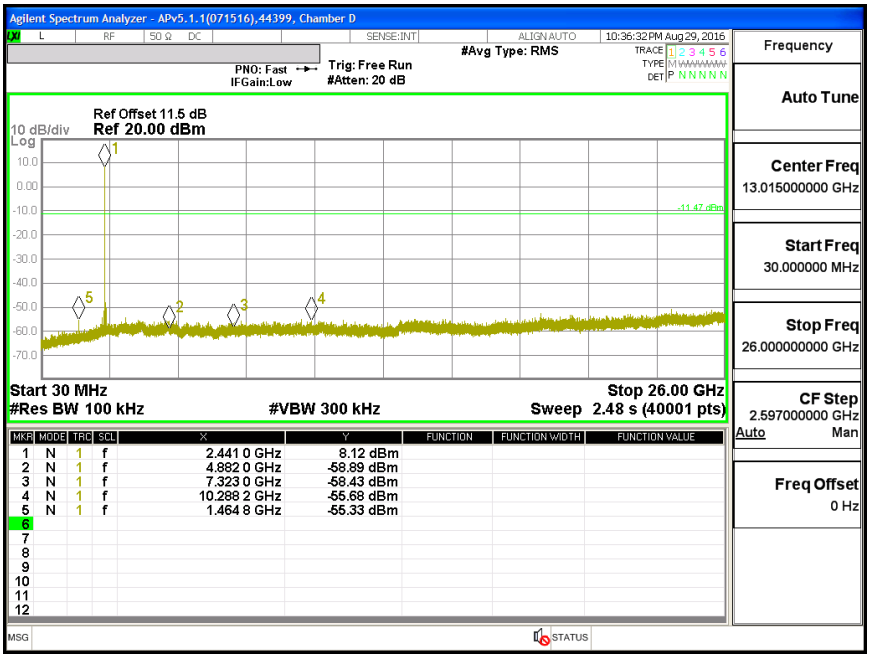


SPURIOUS EMISSIONS, MID CHANNEL

MID CHANNEL

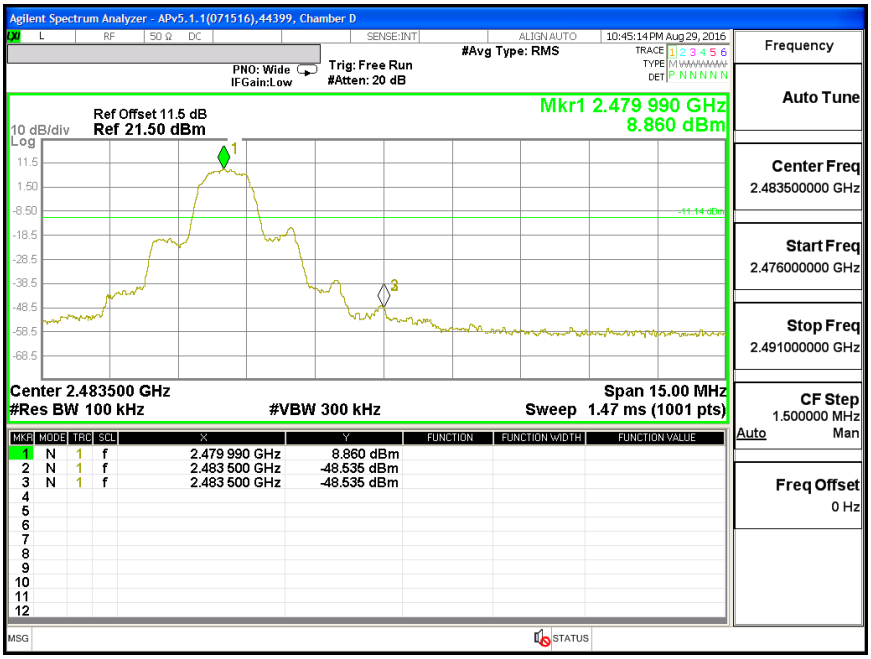


MID CHANNEL SPURIOUS

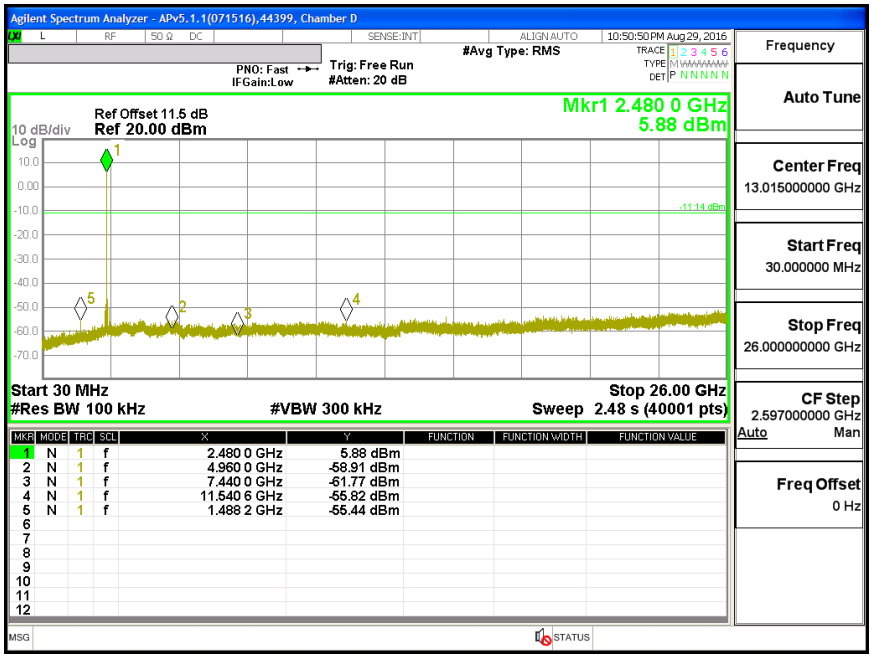


SPURIOUS EMISSIONS, HIGH CHANNEL

HIGH CHANNEL BANDEDGE

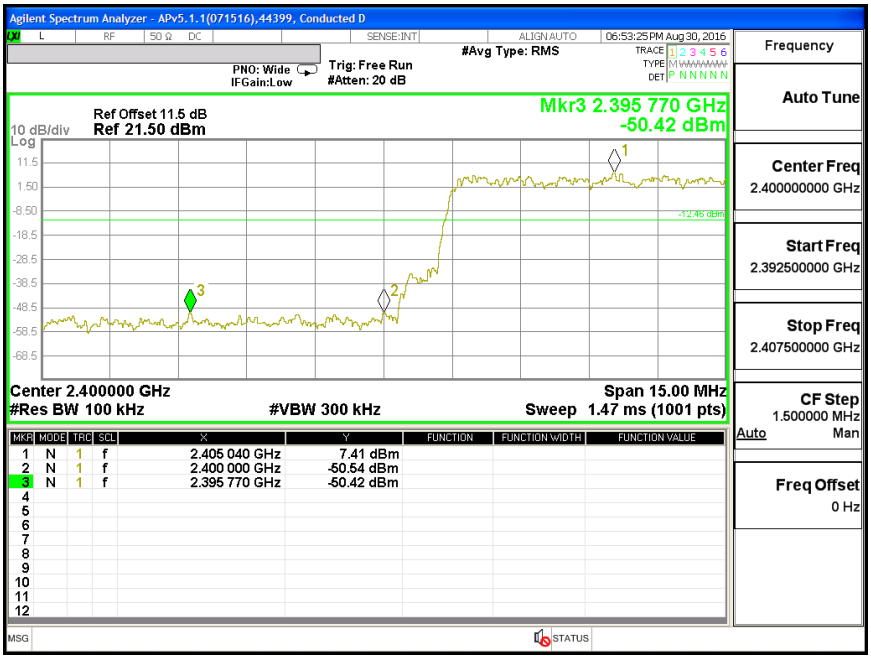


HIGH CHANNEL SPURIOUS

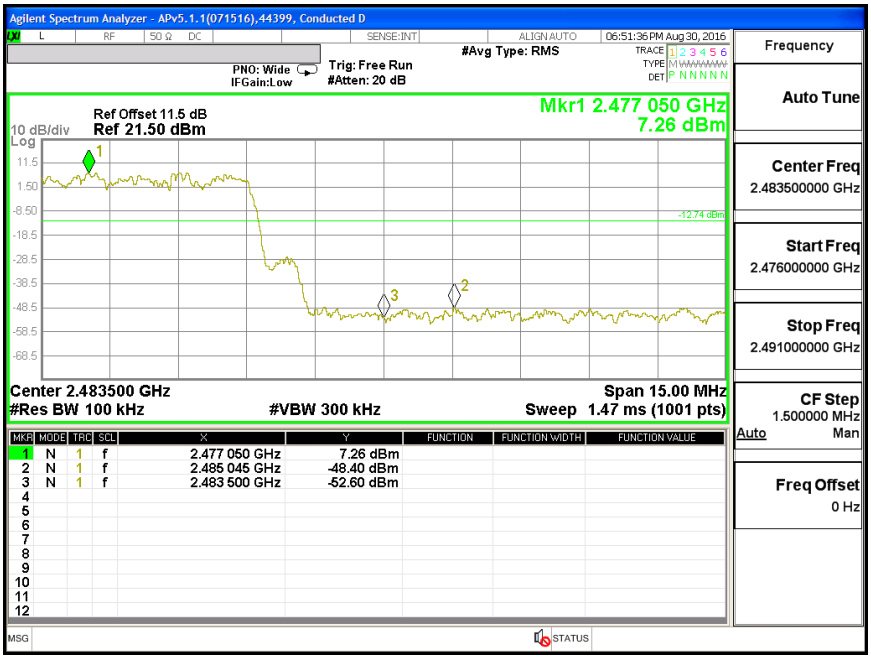


SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

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, Section 8.9 and 8.10.

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 measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

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

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final scans above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T (10 Hz) video bandwidth with peak detector for average measurements.

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak→ this is a note from Radiated automation software. When the frequency is below 1G, software is using RB=100kHz; when the frequency is above 1G, software is using RB=1MHz.

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

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

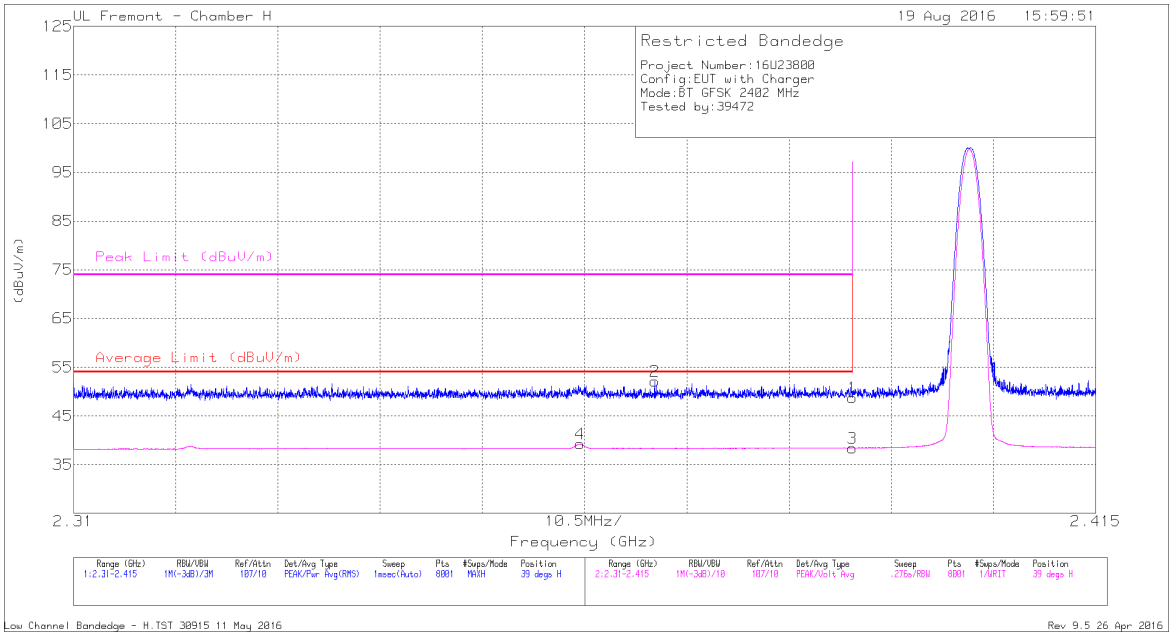
RESULTS

8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL HORIZONTAL PLOT



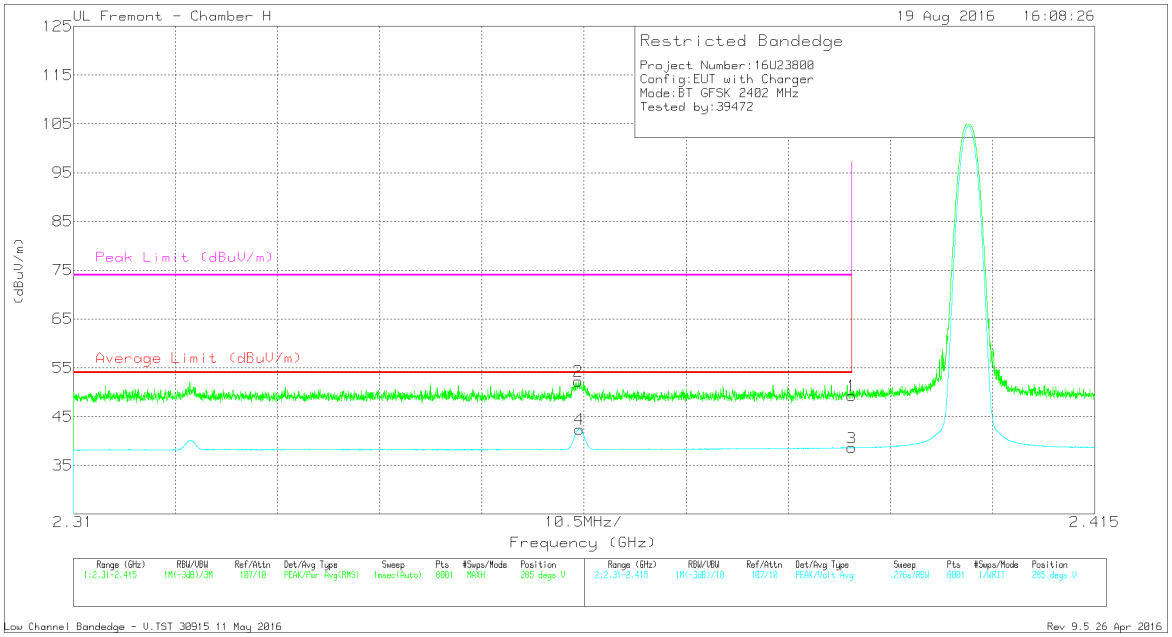
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (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	44.65	Pk	31.9	-27.8	48.75	-	-	74	-25.25	39	235	H
2	* 2.37	48.09	Pk	31.8	-27.8	52.09	-	-	74	-21.91	39	235	H
3	* 2.39	34.35	VA1T	31.9	-27.8	38.45	54	-15.55	-	-	39	235	H
4	* 2.362	35.23	VA1T	31.8	-27.8	39.23	54	-14.77	-	-	39	235	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL VERTICAL PLOT



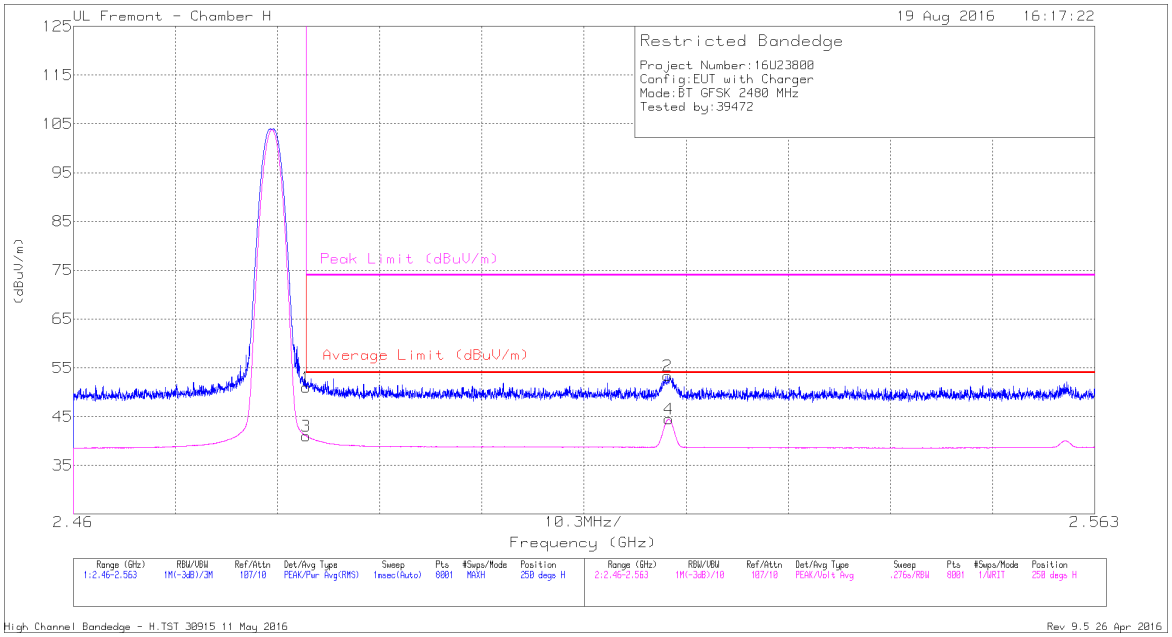
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl /Fltr/Pad (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	45.22	Pk	31.9	-27.8	49.32	-	-	74	-24.68	285	319	V
2	* 2.362	48.3	Pk	31.8	-27.8	52.3	-	-	74	-21.7	285	319	V
3	* 2.39	34.5	VA1T	31.9	-27.8	38.6	54	-15.4	-	-	285	318	V
4	* 2.362	38.39	VA1T	31.8	-27.8	42.39	54	-11.61	-	-	285	318	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL HORIZONTAL PLOT



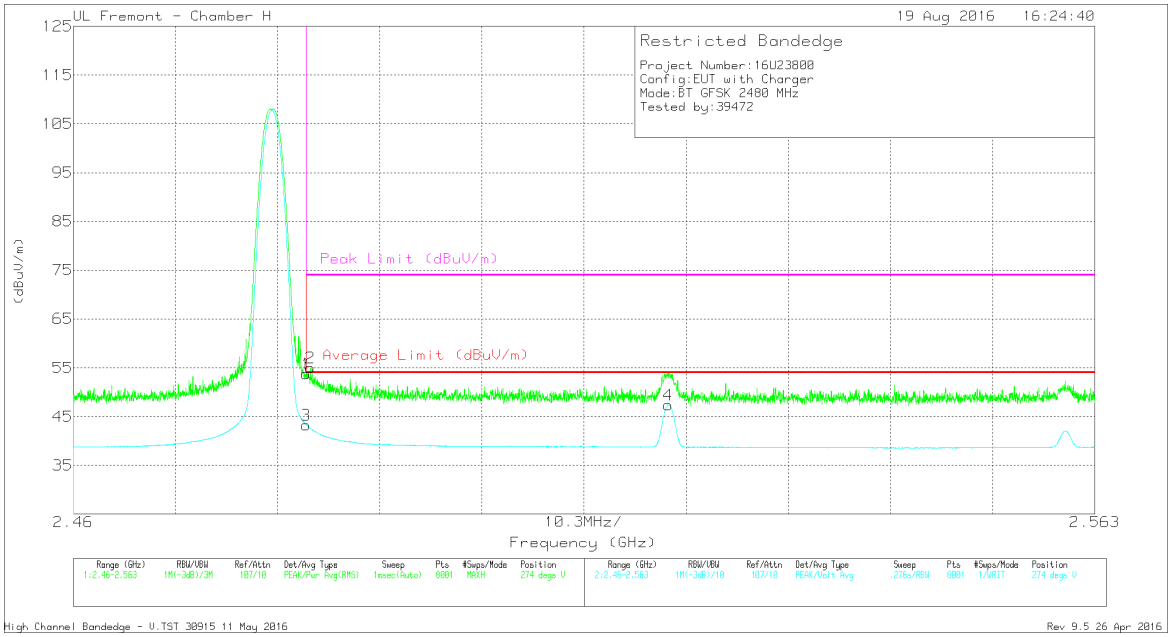
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (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	46.75	Pk	32.2	-27.9	51.05	-	-	74	-22.95	250	328	H
2	2.52	49.08	Pk	32.2	-27.9	53.38	-	-	74	-20.62	250	328	H
3	* 2.484	36.71	VA1T	32.2	-27.9	41.01	54	-12.99	-	-	250	328	H
4	2.52	40.18	VA1T	32.2	-27.9	44.48	54	-9.52	-	-	250	328	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL VERTICAL PLOT



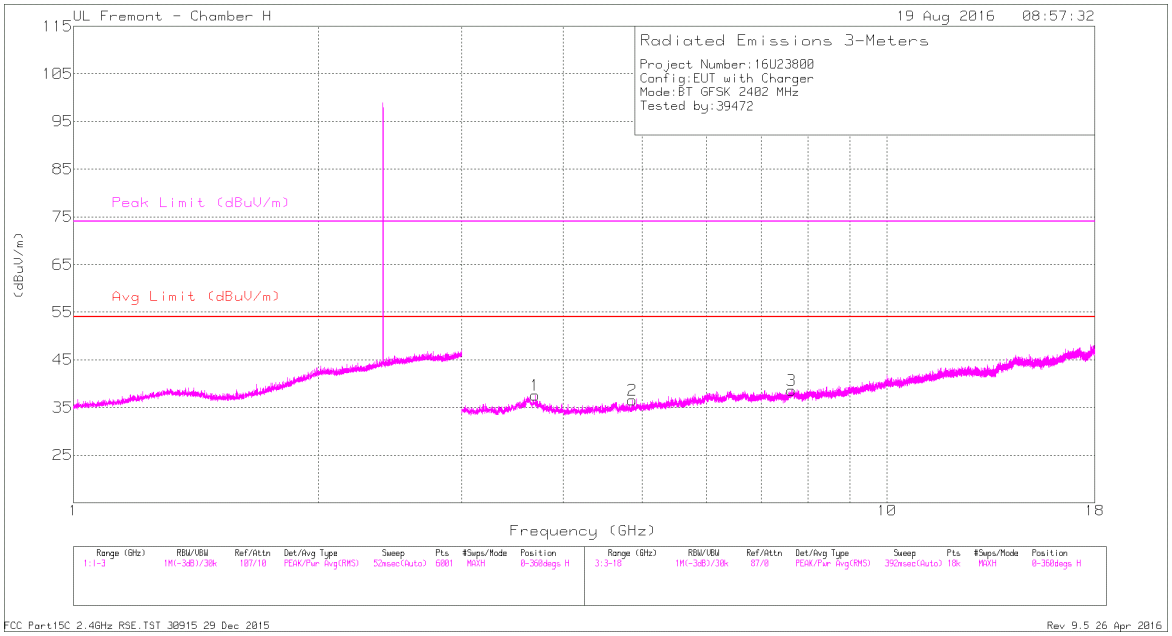
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl /Fltr/Pad (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	49.47	Pk	32.2	-27.9	53.77	-	-	74	-20.23	274	372	V
2	* 2.484	50.71	Pk	32.2	-27.9	55.01	-	-	74	-18.99	274	372	V
3	* 2.484	38.96	VA1T	32.2	-27.9	43.26	54	-10.74	-	-	274	372	V
4	2.52	43.12	VA1T	32.2	-27.9	47.42	54	-6.58	-	-	274	372	V

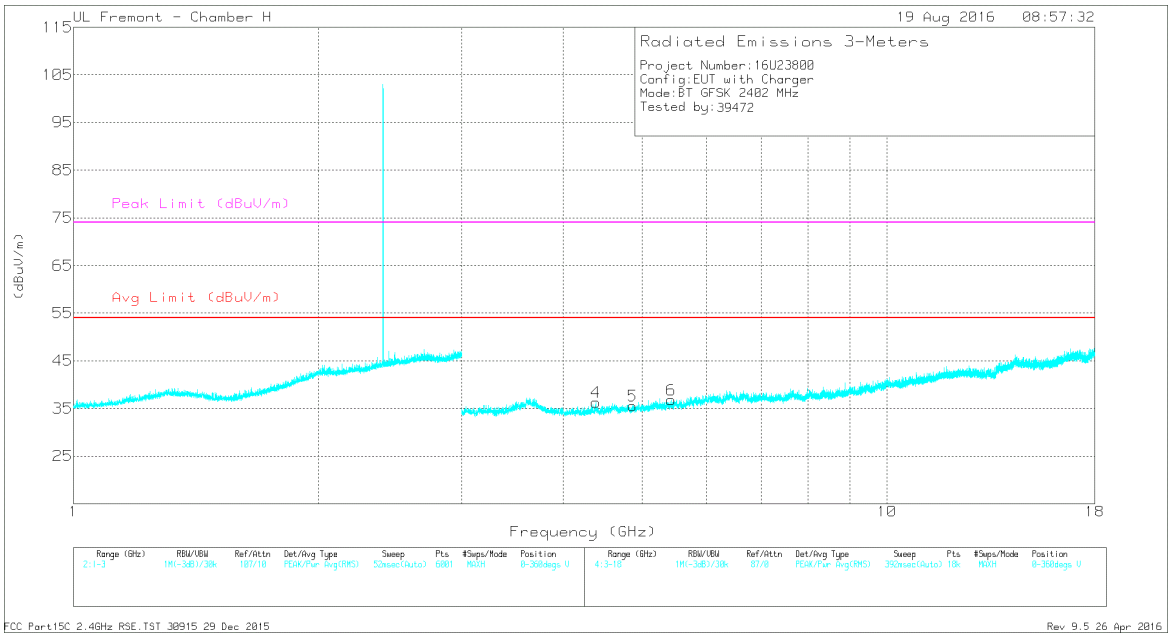
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



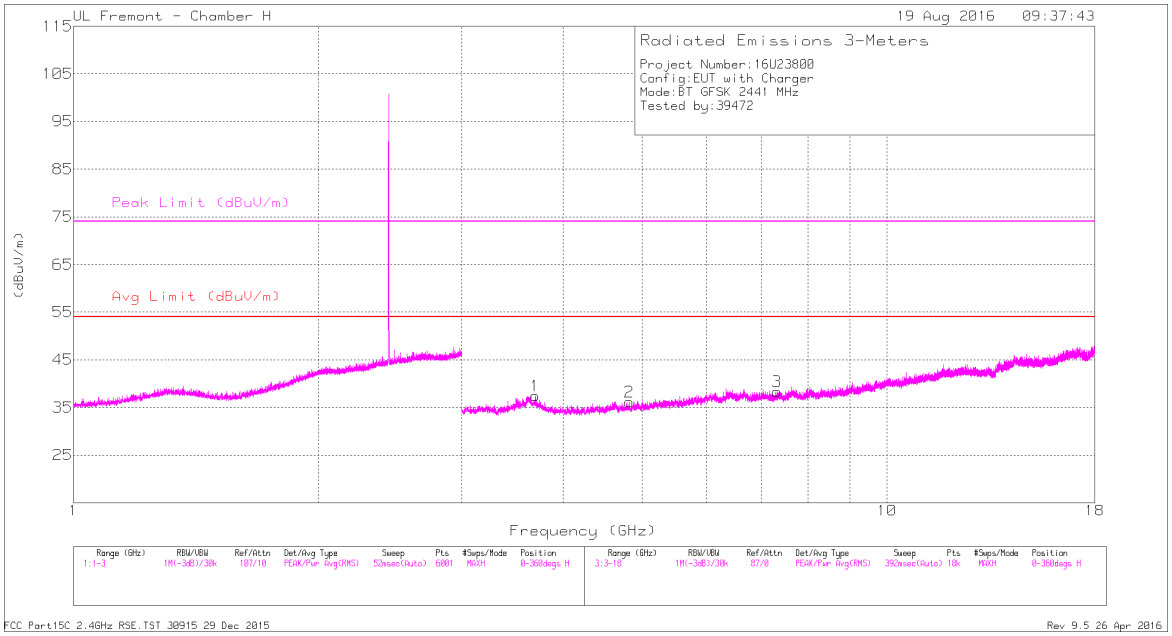
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.695	43.94	PKFH	34.9	-36	42.84	-	-	74	-31.16	30	197	H
	* 3.696	32.36	VA1T	34.9	-36	31.26	54	-22.74	-	-	30	197	H
2	* 4.805	43.25	PKFH	34	-35.1	42.15	-	-	74	-31.85	221	326	H
	* 4.804	31.74	VA1T	34	-35.1	30.64	54	-23.36	-	-	221	326	H
3	* 7.628	38.89	PKFH	35.8	-30.6	44.09	-	-	74	-29.91	202	311	H
	* 7.628	27.77	VA1T	35.8	-30.6	32.97	54	-21.03	-	-	202	311	H
4	* 4.385	42.57	PKFH	33.7	-34.6	41.67	-	-	74	-32.33	244	236	V
	* 4.387	31.09	VA1T	33.7	-34.5	30.29	54	-23.71	-	-	244	236	V
5	* 4.804	44.08	PKFH	34	-35.1	42.98	-	-	74	-31.02	316	229	V
	* 4.804	35	VA1T	34	-35.1	33.9	54	-20.1	-	-	316	229	V
6	* 5.425	40.86	PKFH	34.6	-33.5	41.96	-	-	74	-32.04	283	219	V
	* 5.425	30.09	VA1T	34.6	-33.5	31.19	54	-22.81	-	-	283	219	V

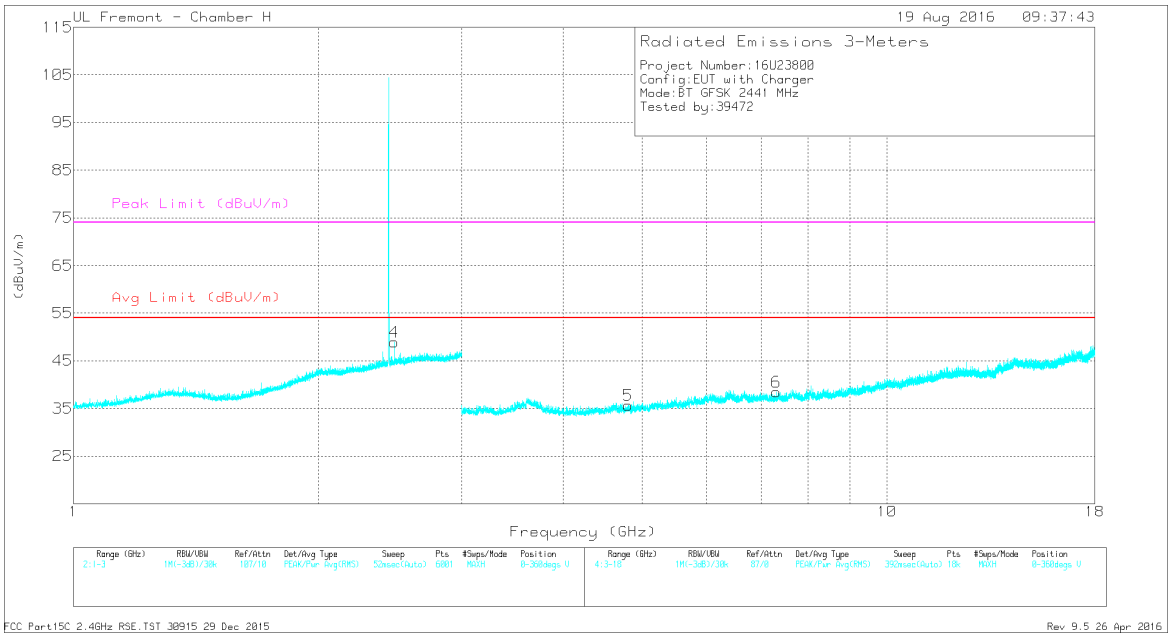
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



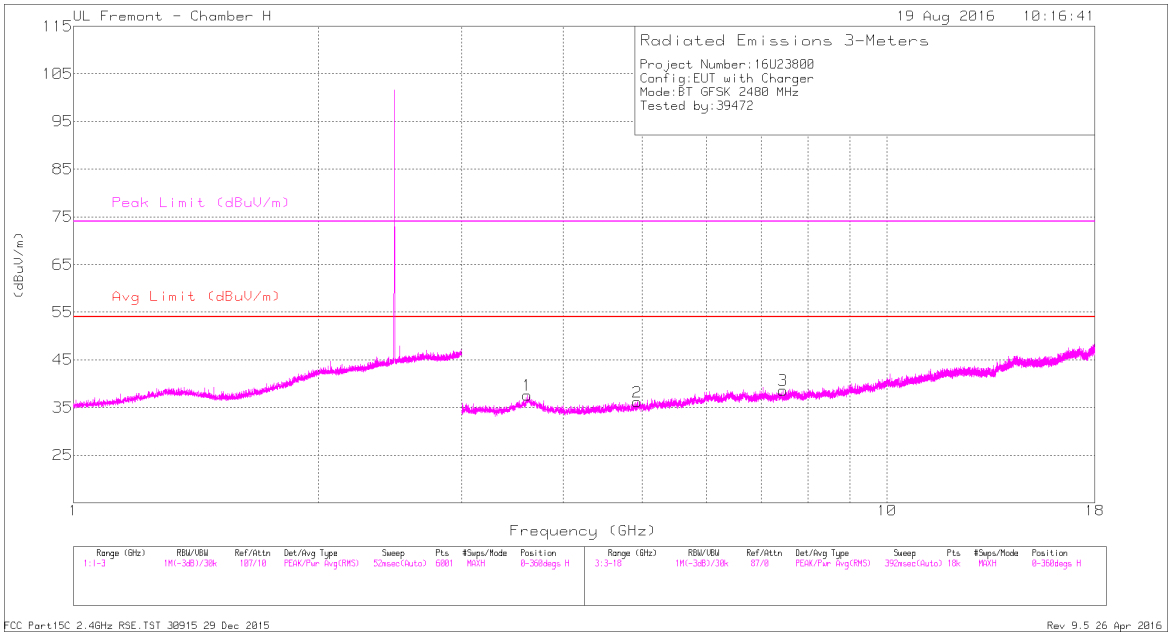
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.7	43.47	PKFH	34.9	-36	42.37	-	-	74	-31.63	209	222	H
	* 3.698	32.33	VA1T	34.9	-36	31.23	54	-22.77	-	-	209	222	H
2	* 4.881	42.12	PKFH	34	-34.7	41.42	-	-	74	-32.58	278	235	H
	* 4.88	31.11	VA1T	34	-34.8	30.31	54	-23.69	-	-	278	235	H
3	* 7.322	40.06	PKFH	35.7	-31.4	44.36	-	-	74	-29.64	104	245	H
	* 7.324	28.25	VA1T	35.7	-31.4	32.55	54	-21.45	-	-	104	245	H
4	2.481	41.71	PKFH	32.2	-19.5	54.41	-	-	-	-	276	316	V
5	* 4.881	43.83	PKFH	34	-34.7	43.13	-	-	74	-30.87	287	268	V
	* 4.882	34.96	VA1T	34	-34.7	34.26	54	-19.74	-	-	287	268	V
6	* 7.322	38.95	PKFH	35.7	-31.4	43.25	-	-	74	-30.75	210	218	V
	* 7.325	28.26	VA1T	35.7	-31.4	32.56	54	-21.44	-	-	210	218	V

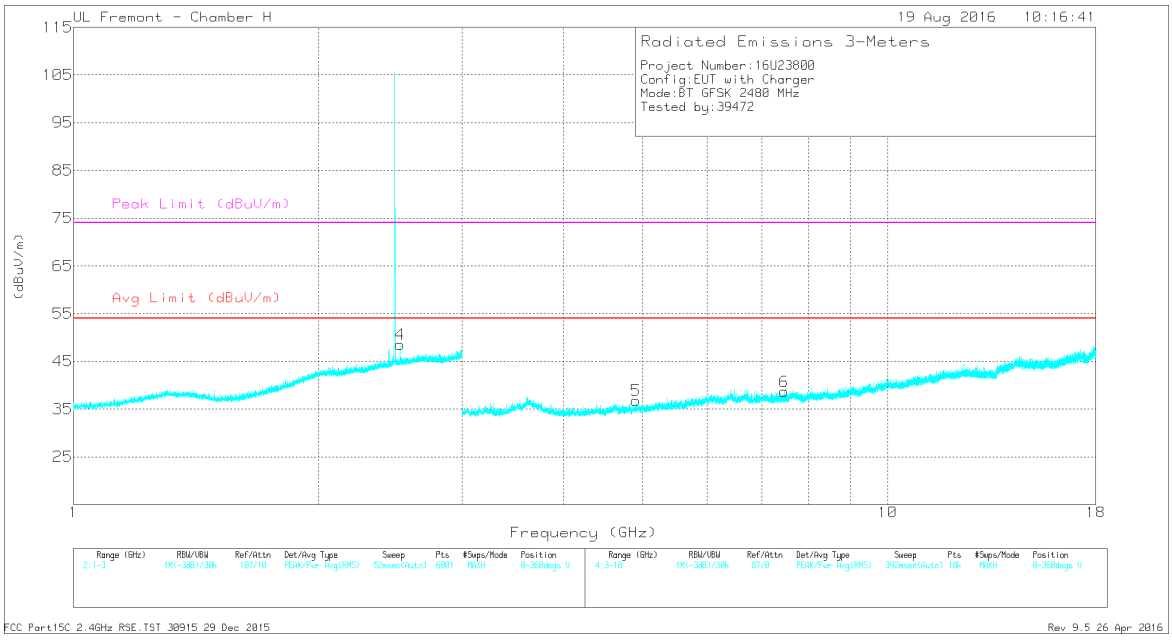
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

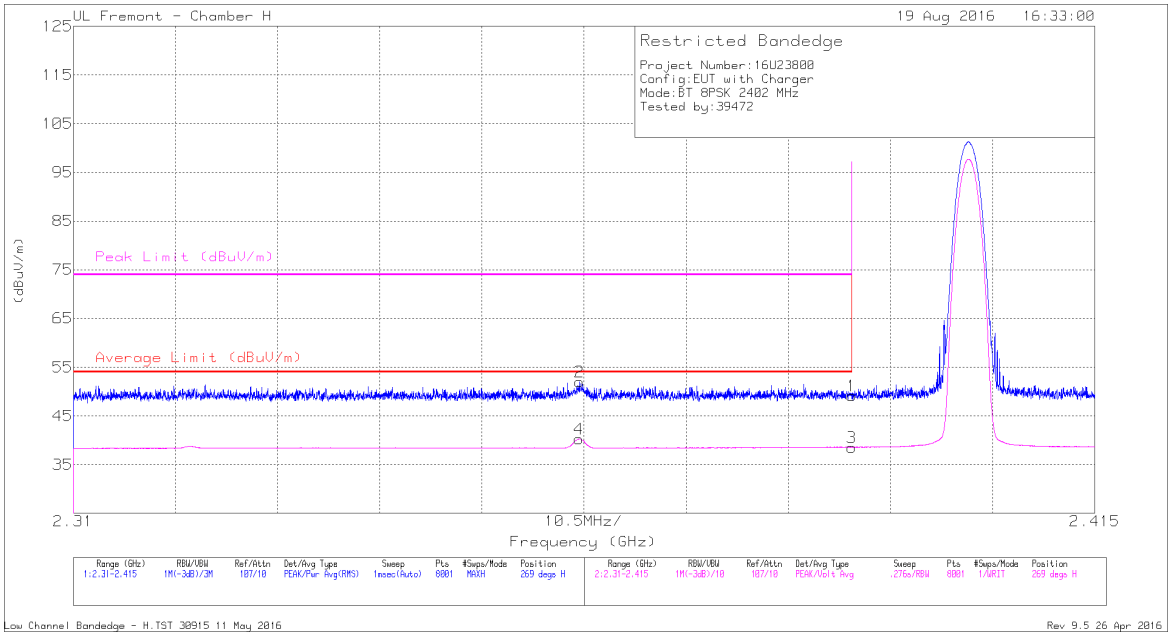
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.614	43.16	PKFH	34.9	-35.7	42.36	-	-	74	-31.64	204	227	H
	* 3.616	31.78	VA1T	34.9	-35.7	30.98	54	-23.02	-	-	204	227	H
2	* 4.96	42.65	PKFH	34	-34.3	42.35	-	-	74	-31.65	235	162	H
	* 4.96	30.79	VA1T	34	-34.3	30.49	54	-23.51	-	-	235	162	H
3	* 7.441	39.77	PKFH	35.7	-31.4	44.07	-	-	74	-29.93	143	230	H
	* 7.442	28	VA1T	35.7	-31.4	32.3	54	-21.7	-	-	143	230	H
4	2.52	42.39	PKFH	32.2	-19.5	55.09	-	-	-	-	278	256	V
5	* 4.96	42.4	PKFH	34	-34.3	42.1	-	-	74	-31.9	112	331	V
	* 4.96	31.04	VA1T	34	-34.3	30.74	54	-23.26	-	-	112	331	V
6	* 7.438	39.91	PKFH	35.7	-31.3	44.31	-	-	74	-29.69	240	185	V
	* 7.441	28.01	VA1T	35.7	-31.4	32.31	54	-21.69	-	-	240	185	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

8.2.2. ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

LOW CHANNEL HORIZONTAL PLOT



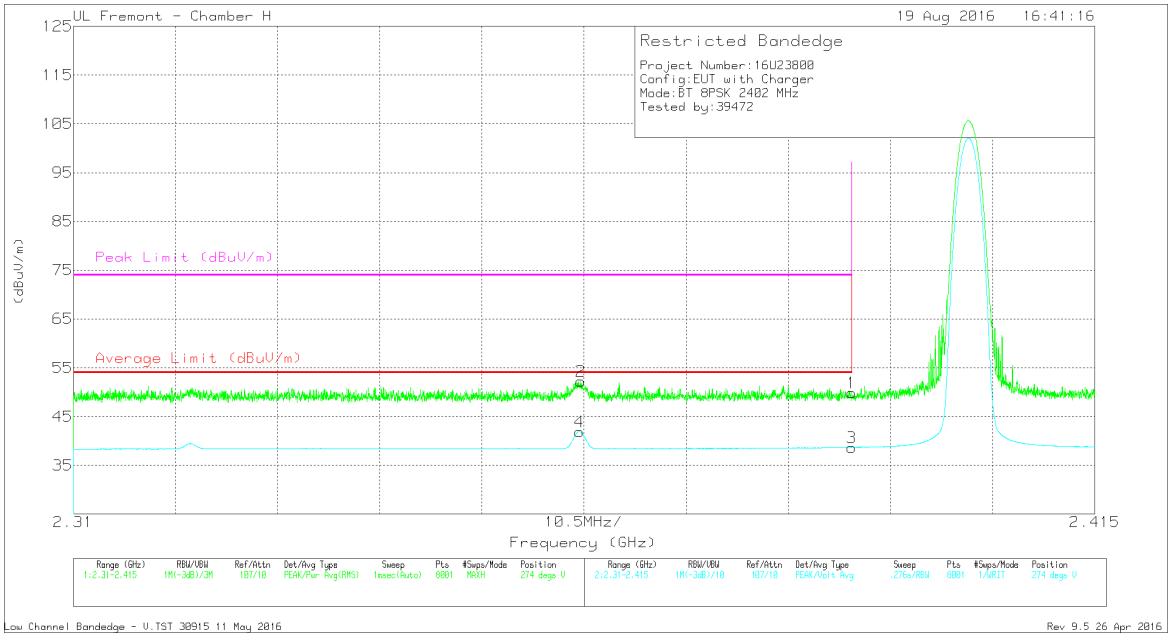
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (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	45.07	Pk	31.9	-27.8	49.17	-	-	74	-24.83	269	369	H
2	* 2.362	47.98	Pk	31.8	-27.8	51.98	-	-	74	-22.02	269	369	H
3	* 2.39	34.47	VA1T	31.9	-27.8	38.57	54	-15.43	-	-	269	369	H
4	* 2.362	36.27	VA1T	31.8	-27.8	40.27	54	-13.73	-	-	269	369	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

LOW CHANNEL VERTICAL PLOT



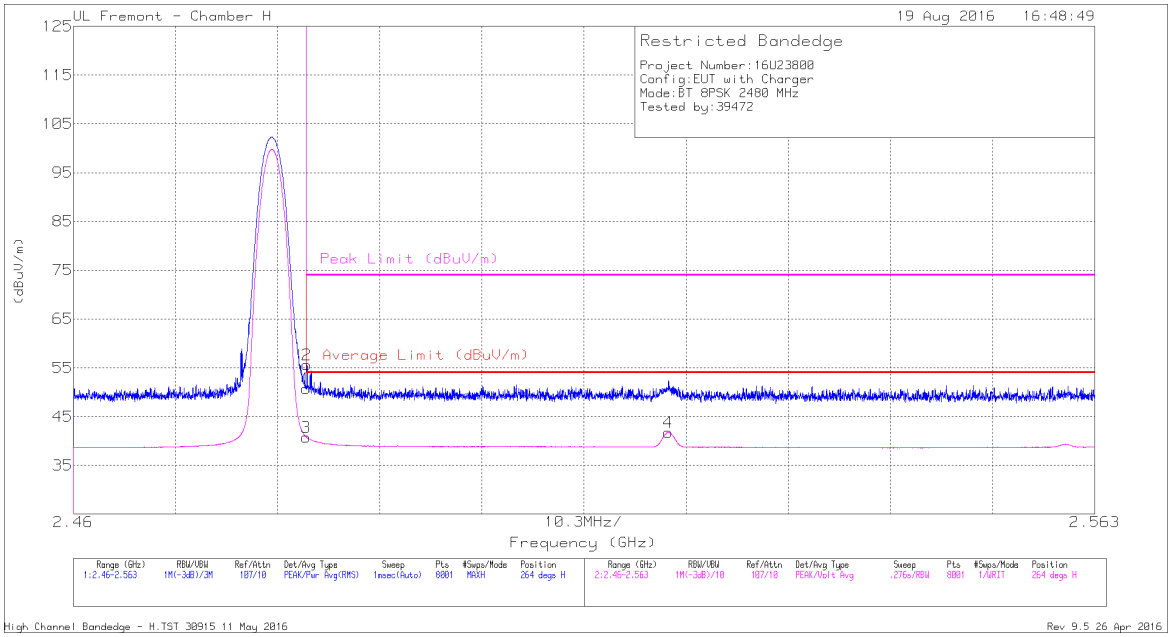
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (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	45.84	Pk	31.9	-27.8	49.94	-	-	74	-24.06	274	349	V
2	* 2.362	48.24	Pk	31.8	-27.8	52.24	-	-	74	-21.76	274	349	V
3	* 2.39	34.59	VA1T	31.9	-27.8	38.69	54	-15.31	-	-	274	349	V
4	* 2.362	37.94	VA1T	31.8	-27.8	41.94	54	-12.06	-	-	274	349	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

HIGH CHANNEL HORIZONTAL PLOT



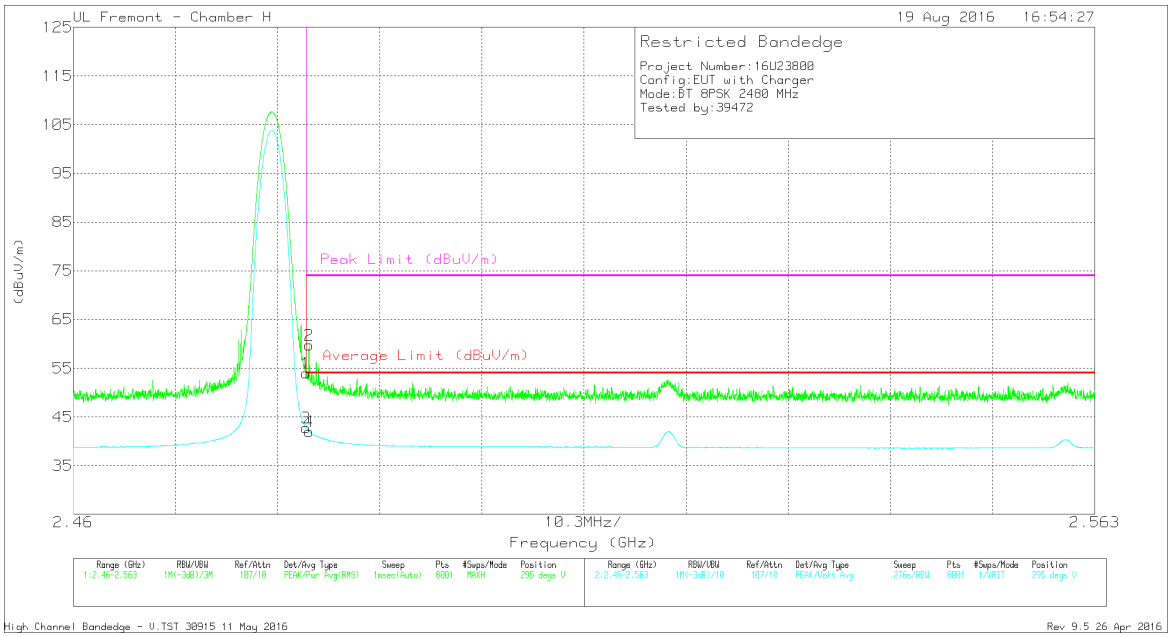
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (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	46.46	Pk	32.2	-27.9	50.76	-	-	74	-23.24	264	369	H
2	* 2.484	51.3	Pk	32.2	-27.9	55.6	-	-	74	-18.4	264	369	H
3	* 2.484	36.49	VA1T	32.2	-27.9	40.79	54	-13.21	-	-	264	369	H
4	2.52	37.45	VA1T	32.2	-27.9	41.75	54	-12.25	-	-	264	369	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)

HIGH CHANNEL VERTICAL PLOT



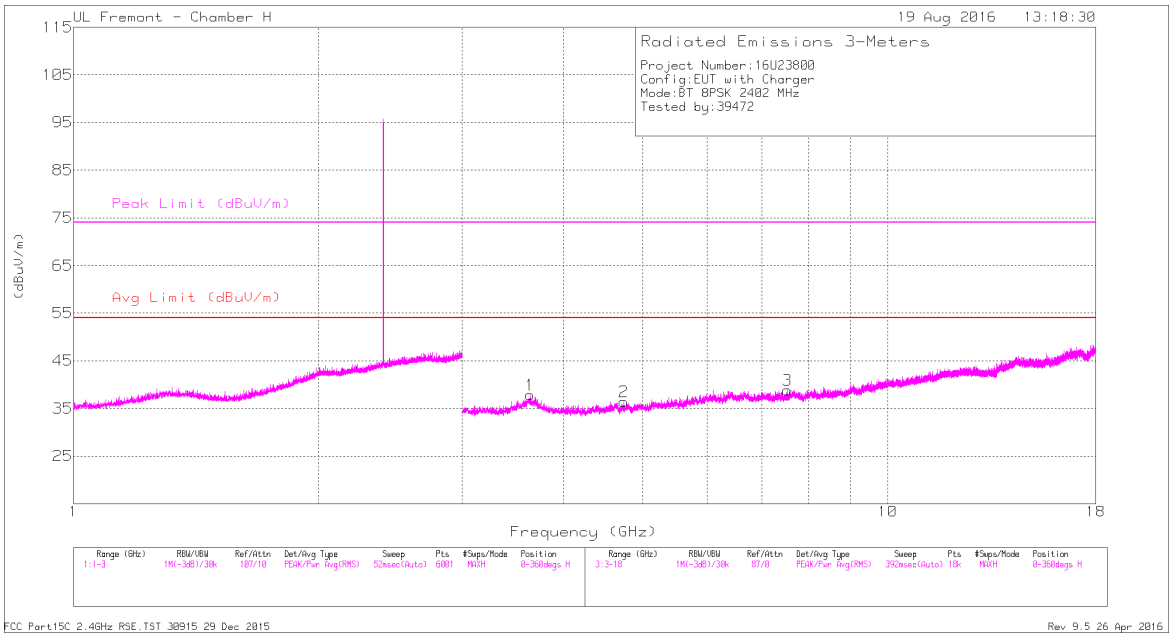
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (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	49.72	Pk	32.2	-27.9	54.02	-	-	74	-19.98	295	371	V
2	* 2.484	55.4	Pk	32.2	-27.9	59.7	-	-	74	-14.3	295	371	V
3	* 2.484	38.46	VA1T	32.2	-27.9	42.76	54	-11.24	-	-	295	371	V
4	* 2.484	37.73	VA1T	32.2	-27.9	42.03	54	-11.97	-	-	295	371	V

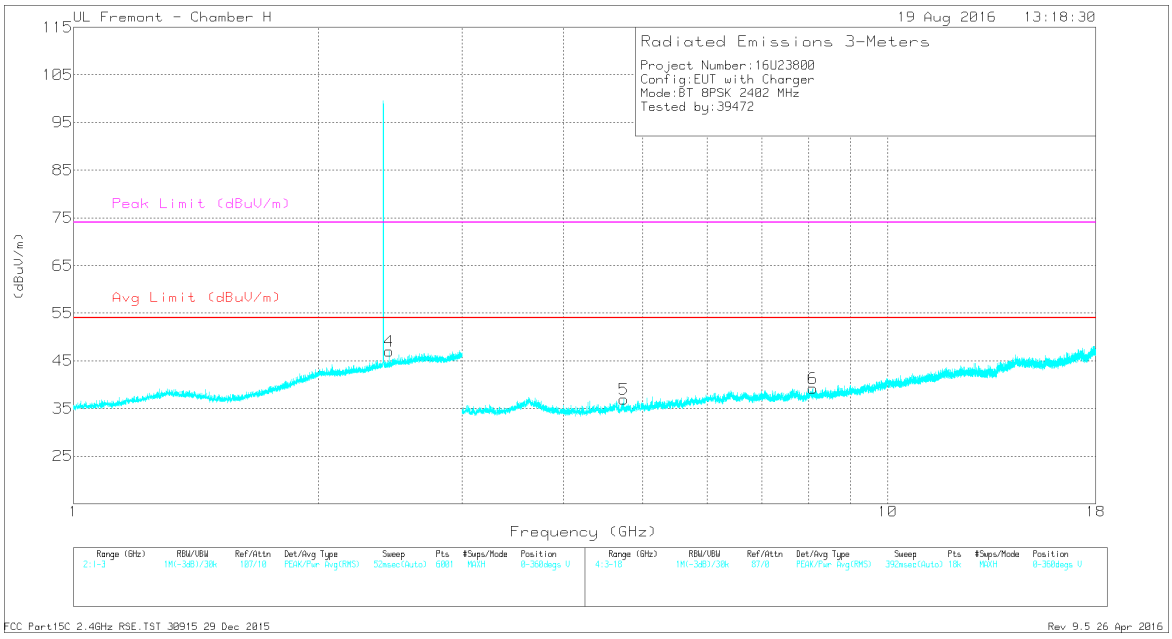
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL PLOT



LOW CHANNEL VERTICAL PLOT



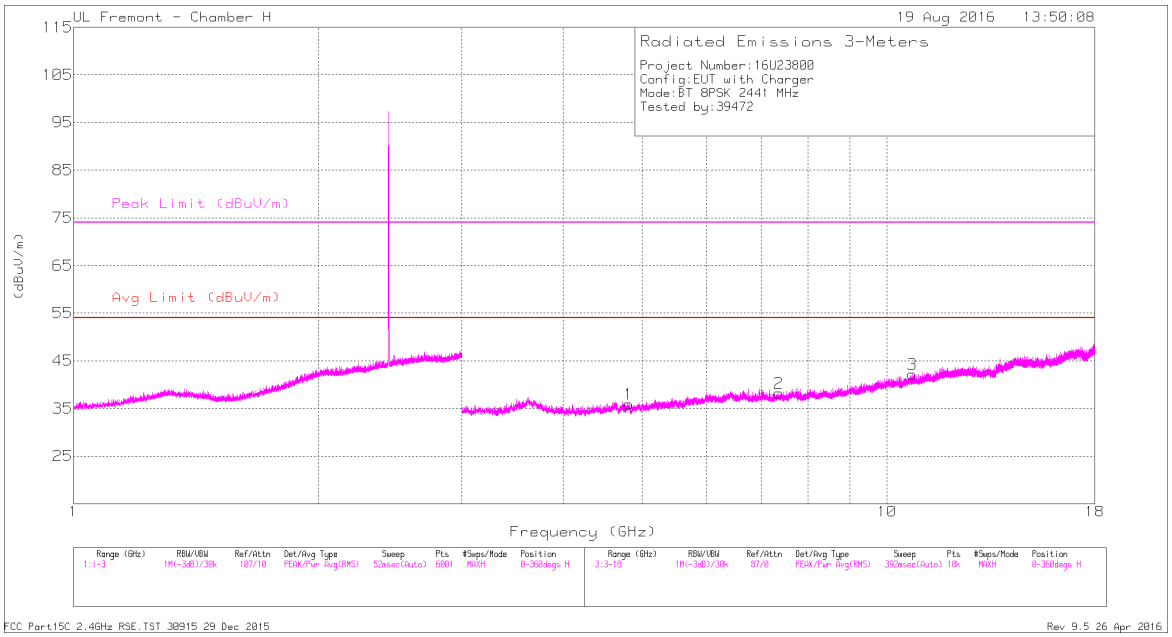
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 3.638	43.3	PKFH	34.9	-35.9	42.3	-	-	74	-31.7	104	233	H
	* 3.637	32.05	VA1T	34.9	-35.9	31.05	54	-22.95	-	-	104	233	H
2	* 4.804	42.84	PKFH	34	-35.1	41.74	-	-	74	-32.26	137	356	H
	* 4.804	31.71	VA1T	34	-35.1	30.61	54	-23.39	-	-	137	356	H
3	* 7.527	39.63	PKFH	35.8	-31.6	43.83	-	-	74	-30.17	86	161	H
	* 7.527	28.47	VA1T	35.8	-31.6	32.67	54	-21.33	-	-	86	161	H
4	2.442	39.95	PKFH	32.1	-19.6	52.45	-	-	-	-	266	383	V
5	* 4.804	43.27	PKFH	34	-35.1	42.17	-	-	74	-31.83	163	101	V
	* 4.804	31.76	VA1T	34	-35.1	30.66	54	-23.34	-	-	163	101	V
6	* 8.097	39.02	PKFH	35.9	-30.6	44.32	-	-	74	-29.68	206	239	V
	* 8.095	27.82	VA1T	35.9	-30.6	33.12	54	-20.88	-	-	206	239	V

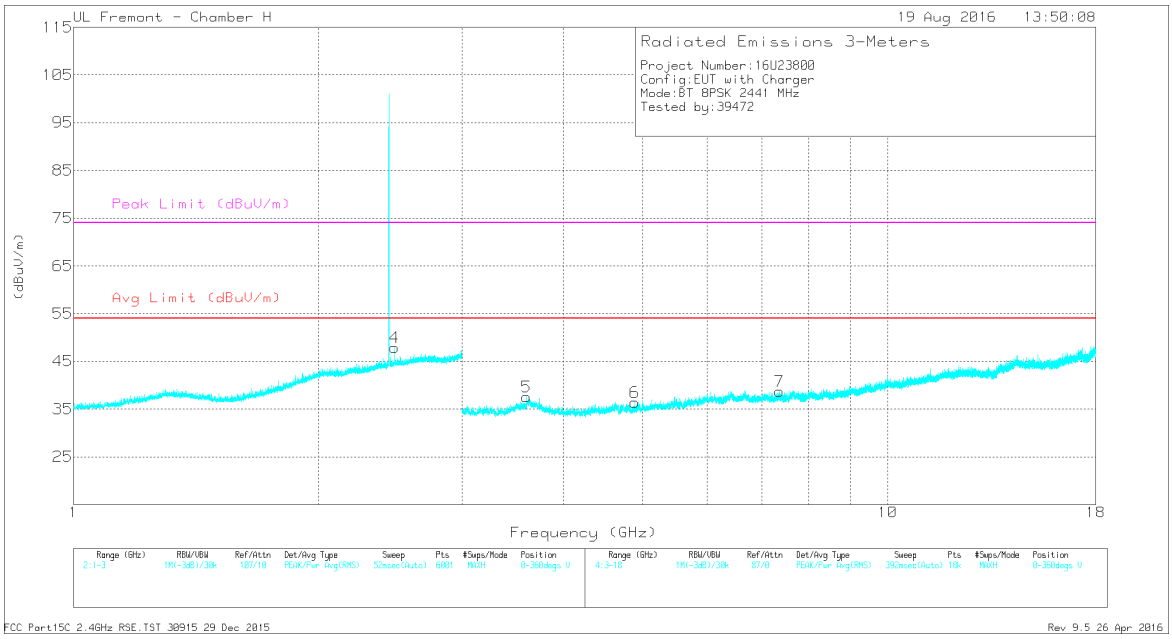
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

MID CHANNEL HORIZONTAL PLOT



MID CHANNEL VERTICAL PLOT



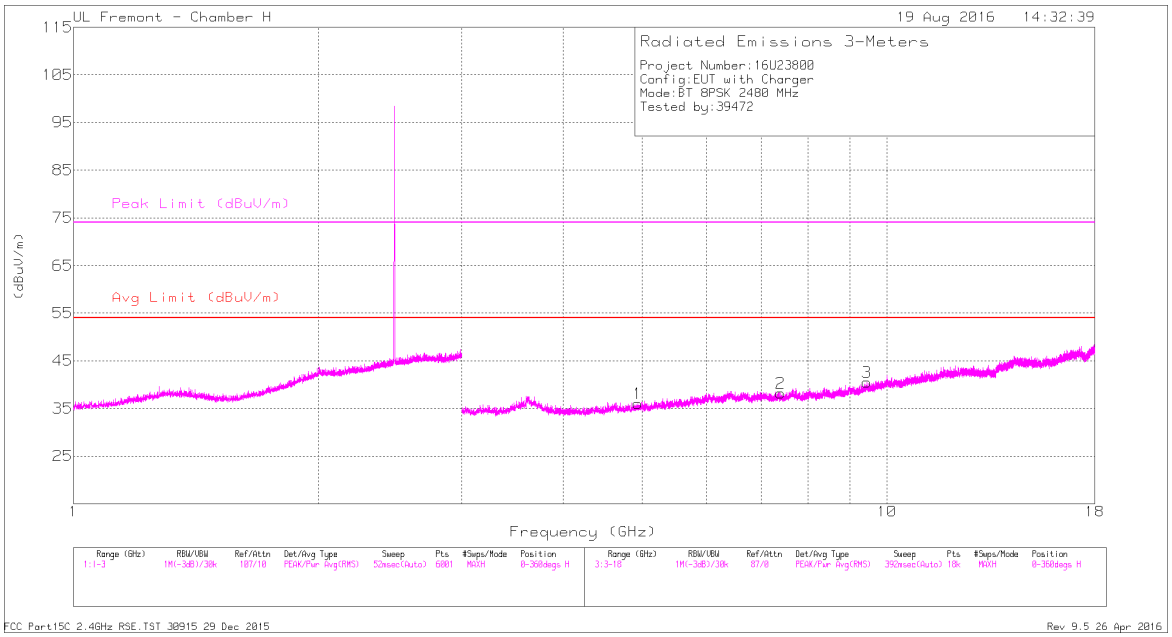
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	42.49	PKFH	34	-34.7	41.79	-	-	74	-32.21	214	201	H
	* 4.88	31.15	VA1T	34	-34.8	30.35	54	-23.65	-	-	214	201	H
2	* 7.321	40.47	PKFH	35.7	-31.5	44.67	-	-	74	-29.33	263	167	H
	* 7.321	28.13	VA1T	35.7	-31.5	32.33	54	-21.67	-	-	263	167	H
3	* 10.752	37.7	PKFH	38.1	-28.5	47.3	-	-	74	-26.7	163	100	H
	* 10.75	26.61	VA1T	38.1	-28.5	36.21	54	-17.79	-	-	163	100	H
4	2.481	40.96	PKFH	32.2	-19.5	53.66	-	-	-	-	276	232	V
5	* 3.604	43.22	PKFH	34.9	-35.6	42.52	-	-	74	-31.48	163	143	V
	* 3.606	31.57	VA1T	34.9	-35.7	30.77	54	-23.23	-	-	163	143	V
6	* 4.88	42.54	PKFH	34	-34.8	41.74	-	-	74	-32.26	348	387	V
	* 4.882	31.61	VA1T	34	-34.7	30.91	54	-23.09	-	-	348	387	V
7	* 7.324	40.98	PKFH	35.7	-31.4	45.28	-	-	74	-28.72	250	337	V
	* 7.321	28.37	VA1T	35.7	-31.4	32.67	54	-21.33	-	-	250	337	V

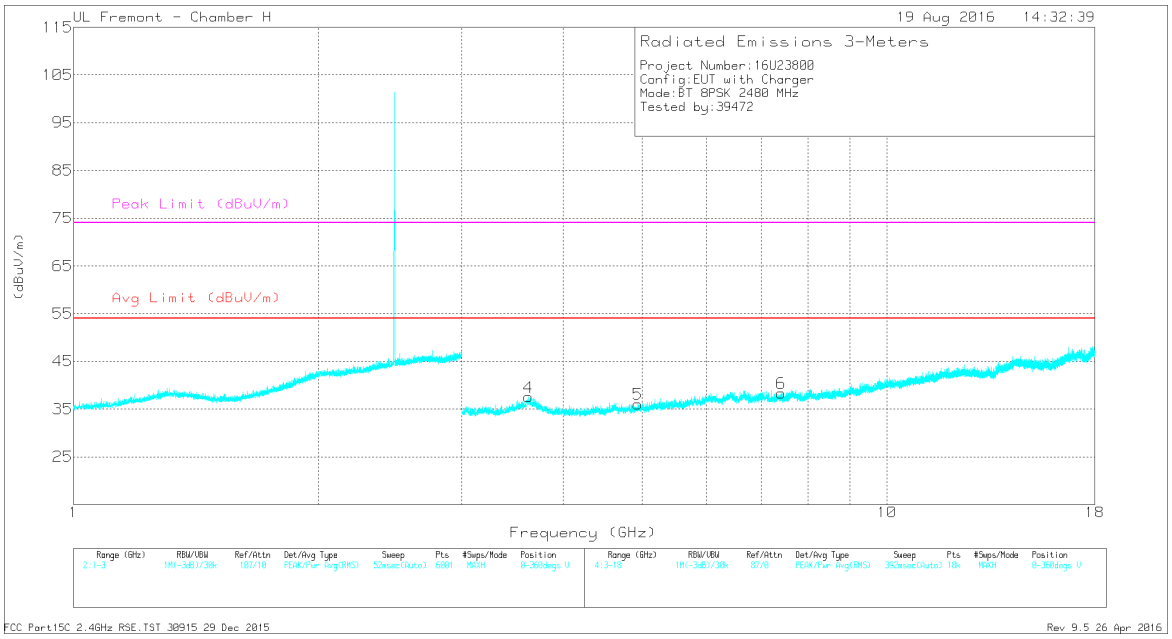
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

HIGH CHANNEL HORIZONTAL PLOT



HIGH CHANNEL VERTICAL PLOT



DATA

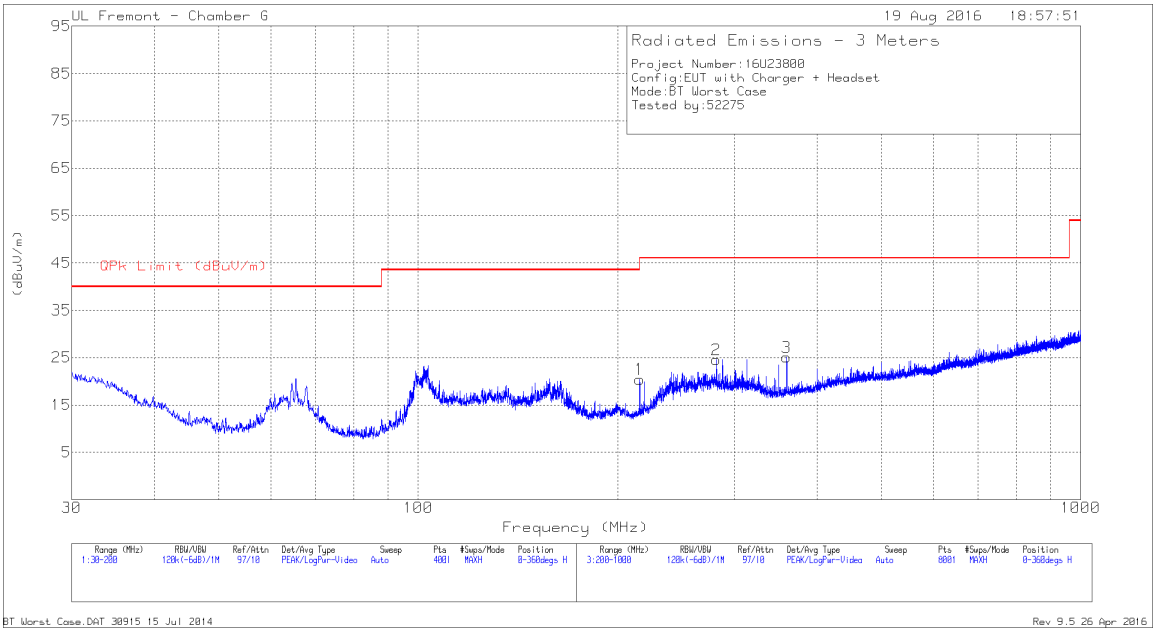
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T120 (dB/m)	Amp/Cbl/ Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/ m)	Margin (dB)	Peak Limit (dBuV/ m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.962	41.87	PKFH	34	-34.3	41.57	-	-	74	-32.43	232	180	H
	* 4.962	30.81	VA1T	34	-34.3	30.51	54	-23.49	-	-	232	180	H
2	* 7.442	39.65	PKFH	35.7	-31.4	43.95	-	-	74	-30.05	228	235	H
	* 7.438	28.03	VA1T	35.7	-31.3	32.43	54	-21.57	-	-	228	235	H
3	* 9.446	39.12	PKFH	36.8	-28.9	47.02	-	-	74	-26.98	326	135	H
	* 9.445	26.87	VA1T	36.8	-28.8	34.87	54	-19.13	-	-	326	135	H
4	* 3.626	42.75	PKFH	34.9	-35.8	41.85	-	-	74	-32.15	10	127	V
	* 3.625	31.92	VA1T	34.9	-35.8	31.02	54	-22.98	-	-	10	127	V
5	* 4.96	43.15	PKFH	34	-34.3	42.85	-	-	74	-31.15	253	184	V
	* 4.96	31.64	VA1T	34	-34.3	31.34	54	-22.66	-	-	253	184	V
6	* 7.439	39.57	PKFH	35.7	-31.3	43.97	-	-	74	-30.03	76	121	V
	* 7.442	28.12	VA1T	35.7	-31.4	32.42	54	-21.58	-	-	76	121	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

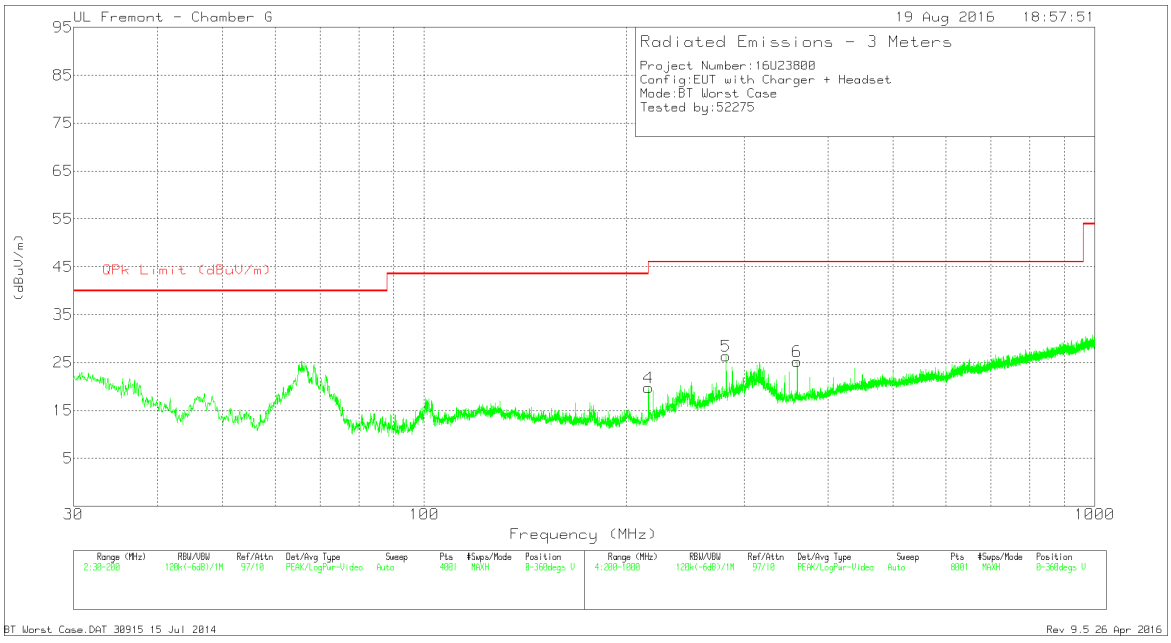
8.3. WORST-CASE BELOW 1 GHz

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

HORIZONTAL PLOT



VERTICAL: PLOT



DATA

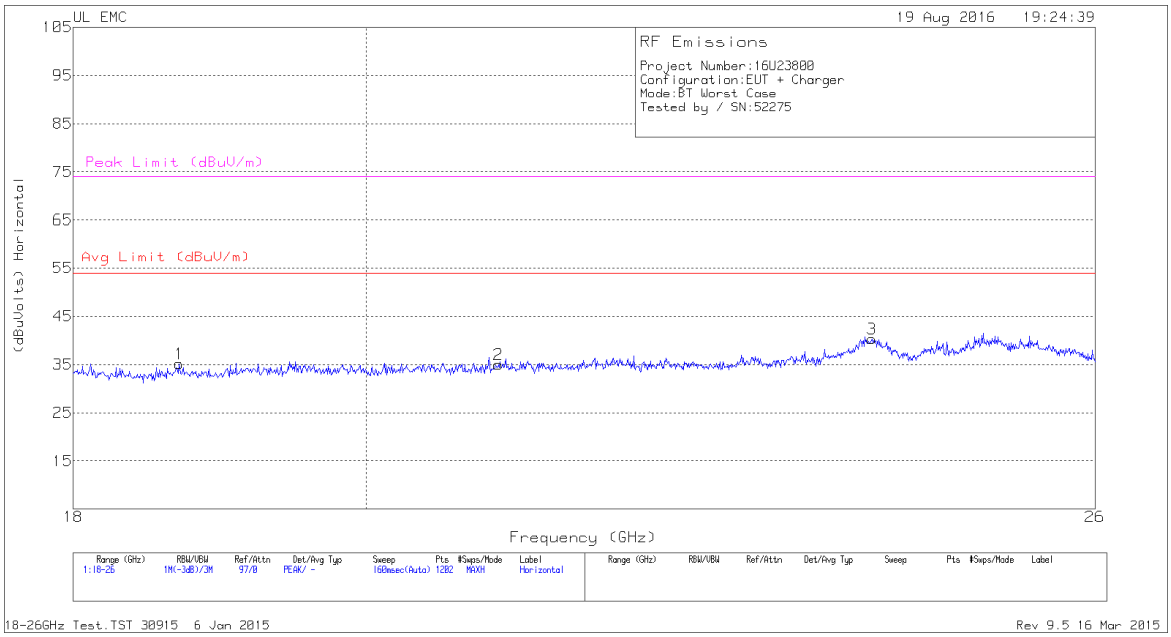
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T407 (dB/m)	Amp/Cbl (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 282.1	36.56	Pk	17.3	-29.3	0	24.56	46.02	-21.46	0-360	100	H
5	* 282.1	38.31	Pk	17.3	-29.3	0	26.31	46.02	-19.71	0-360	201	V
1	216	35.66	Pk	14.4	-29.6	0	20.46	43.52	-23.06	0-360	199	H
4	216	34.92	Pk	14.4	-29.6	0	19.72	43.52	-23.8	0-360	201	V
3	360	35.24	Pk	18.7	-28.8	0	25.14	46.02	-20.88	0-360	100	H
6	360	35.37	Pk	18.7	-28.8	0	25.27	46.02	-20.75	0-360	201	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

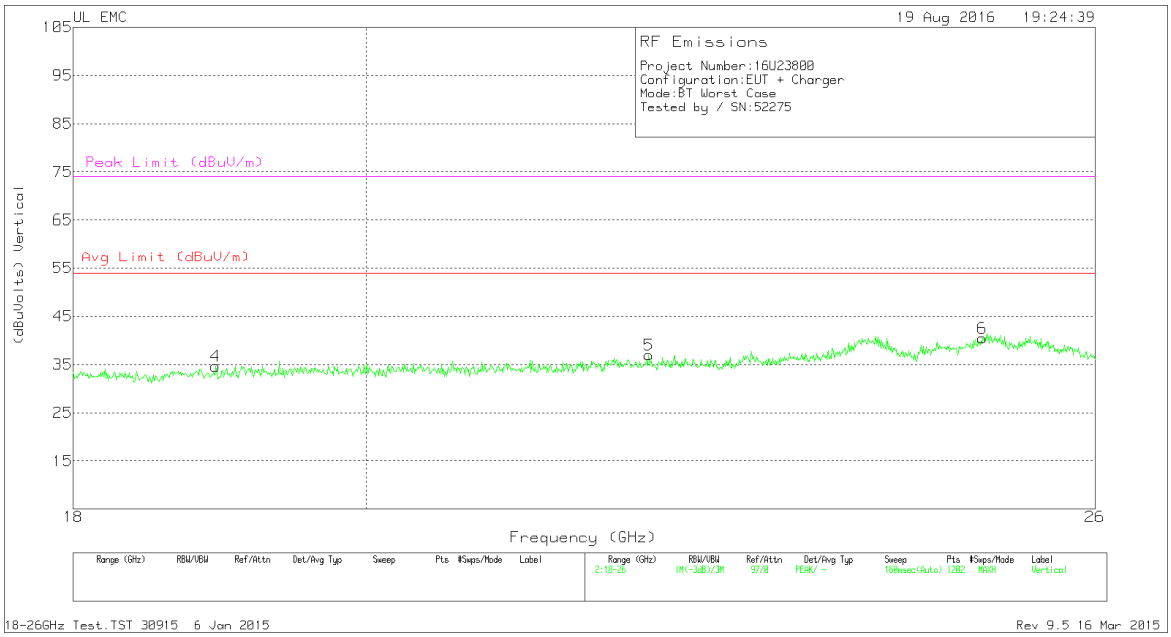
8.4. WORST-CASE 18 to 26 GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T449 (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	18.699	36.47	Pk	32.4	-24.2	-9.5	35.17	54	-18.83	74	-38.83
2	20.978	37.1	Pk	33.1	-25.7	-9.5	35	54	-19	74	-39
3	23.995	40.23	Pk	34	-24.4	-9.5	40.33	54	-13.67	74	-33.67
4	18.946	36.67	Pk	32.5	-25	-9.5	34.67	54	-19.33	74	-39.33
5	22.143	37.8	Pk	33.5	-24.8	-9.5	37	54	-17	74	-37
6	24.968	40	Pk	34.2	-24.2	-9.5	40.5	54	-13.5	74	-33.5

Pk - Peak detector

8.5. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	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 C63.10.

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

WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables 1&3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
1	.15675	34.19	Qp	0	0	10.1	44.29	65.63	-21.34	-	-
2	.15675	31.7	Ca	0	0	10.1	41.8	-	-	55.63	-13.83
3	.2085	24.63	Qp	0	0	10.1	34.73	63.26	-28.53	-	-
4	.20625	8.99	Ca	0	0	10.1	19.09	-	-	53.35	-34.26
5	.4695	21.37	Qp	0	0	10.1	31.47	56.52	-25.05	-	-
6	.46725	13.09	Ca	0	0	10.1	23.19	-	-	46.56	-23.37
7	.93975	21.01	Qp	0	0	10.1	31.11	56	-24.89	-	-
8	.93975	12.06	Ca	0	0	10.1	22.16	-	-	46	-23.84
9	6.38925	25.34	Qp	0	.1	10.2	35.64	60	-24.36	-	-
10	6.38813	19.11	Ca	0	.1	10.2	29.41	-	-	50	-20.59
11	16.46025	25.2	Qp	0	.2	10.3	35.7	60	-24.3	-	-
12	16.3905	19.72	Ca	0	.2	10.3	30.22	-	-	50	-19.78

Range 2: Line-L2 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables 2&3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR) Margin (dB)
13	.19725	23.29	Qp	0	0	10.1	33.39	63.73	-30.34	-	-
14	.195	5.68	Ca	0	0	10.1	15.78	-	-	53.82	-38.04
15	.3255	18.61	Qp	0	0	10.1	28.71	59.57	-30.86	-	-
16	.32325	7.83	Ca	0	0	10.1	17.93	-	-	49.62	-31.69
17	.52575	18.08	Qp	0	0	10.1	28.18	56	-27.82	-	-
18	.52575	4.87	Ca	0	0	10.1	14.97	-	-	46	-31.03
19	.7575	18.86	Qp	0	0	10.1	28.96	56	-27.04	-	-
20	.76425	4.27	Ca	0	0	10.1	14.37	-	-	46	-31.63
21	6.441	25.96	Qp	0	.1	10.2	36.26	60	-23.74	-	-
22	6.43875	19.61	Ca	0	.1	10.2	29.91	-	-	50	-20.09
23	17.38163	25.41	Qp	0	.2	10.3	35.91	60	-24.09	-	-
24	17.38275	19.87	Ca	0	.2	10.3	30.37	-	-	50	-19.63

Qp - Quasi-Peak detector

Ca - CISPR average detection

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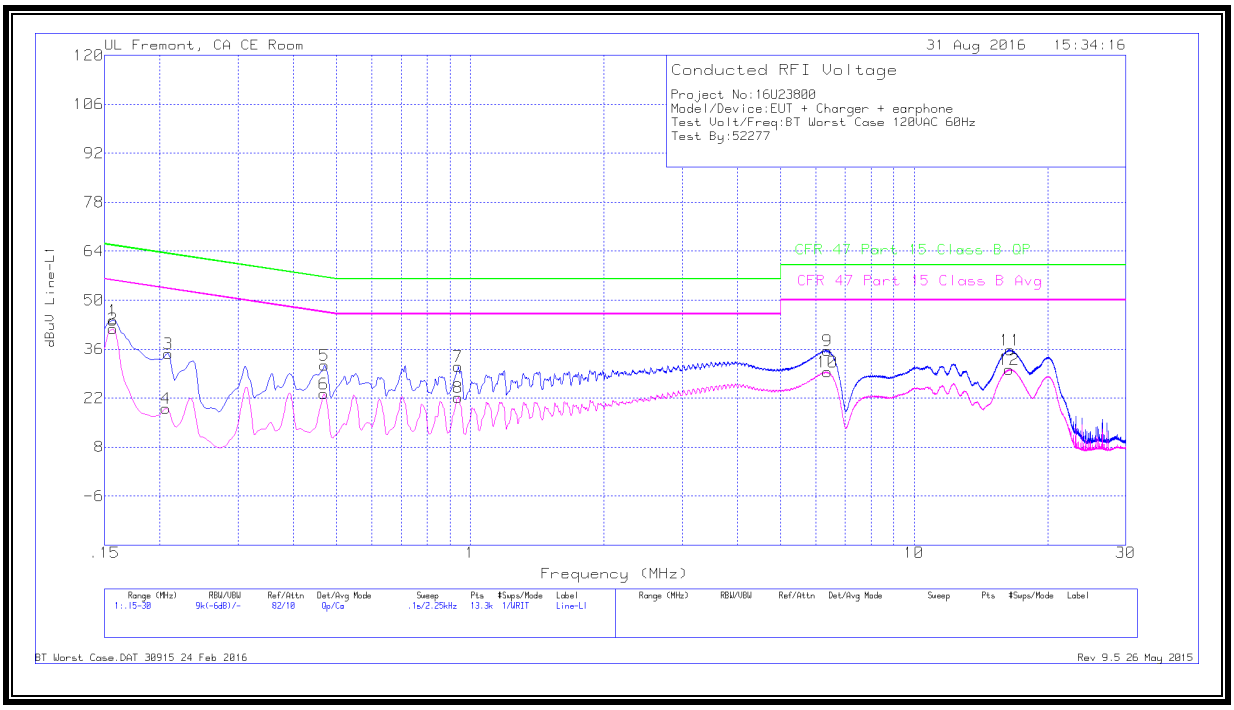
Rev 9.5 26 May 2015

LINE 1 RESULTS



LINE 2 RESULTS