CERTIFICATION TEST REPORT

Report Number. : 12455723-E2V1

Applicant	:	FITBIT INC. 199 FREMONT ST, 14TH FLOOR SAN FRANCISCO, CA 94105, U.S.A
Model	:	FB415
FCC ID	:	XRAFB415
IC	:	8542A-FB415
EUT Description	:	SMART WATCH
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS - 247 ISSUE 2 ISED RSS - GEN ISSUE 5

Date Of Issue:
November 26, 2018

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP Lab code: 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	11/26/2018	Initial Issue	--

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: FITBIT INC.
199 FREMONT ST, 14TH FLOOR
SAN FRANCISCO,
CA 94105, U.S.A

EUT DESCRIPTION: SMART WATCH

MODEL: FB415

SERIAL NUMBER: EVT-FA2-342, EVT-FA2-338 (CONDUCTED)
EVT-FA7197 (RADIATED)

DATE TESTED: OCTOBER 10 to NOVEMBER 19, 2018

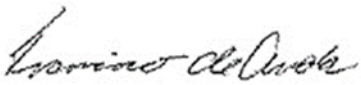
APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

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 the U.S. government.

Approved & Released For
UL Verification Services Inc. By:



FRANCISCO DE ANDA
OPERATIONS LEAD
UL Verification Services Inc.

Prepared By:

ERIC YU
TEST ENGINEER
UL Verification Services Inc.

Reviewed By:

TINA CHU
SENIOR PROJECT 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, KDB 558074 D01 15.247 Meas Guidance v05, RSS-GEN Issue 5, and RSS-247 Issue 2.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. 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	47658 Kato Rd.
☐ Chamber A (ISED:2324B-1)	☐ Chamber D (ISED:22541-1)	☐ Chamber I (ISED: 2324A-5)
☐ Chamber B (ISED:2324B-2)	☐ Chamber E (ISED:22541-2)	☒ Chamber J (ISED: 2324A-6)
☒ Chamber C (ISED:2324B-3)	☐ Chamber F (ISED:22541-3)	☐ Chamber K (ISED: 2324A-1)
	☐ Chamber G (ISED:22541-4)	☐ Chamber L (ISED: 2324A-3)
	☐ Chamber H (ISED:22541-5)	

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code. UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

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

RADIATED EMISSIONS

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

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:
Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
36.5 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 dBuV

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Worst Case 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 equipment under test is a smart watch.

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	11.23	13.27
	DQPSK	10.23	10.54
	Enhanced 8PSK	10.65	11.61

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Band (GHz)	Antenna Peak Gain (dBi)
2.4	-8.37

5.4. SOFTWARE AND FIRMWARE

The test utility software used during testing was Teraterm.

The firmware installed in the EUT during testing was Version 38.4.0.21

5.5. WORST-CASE CONFIGURATION AND MODE

EUT has 1 type of plastic wristband and 3 types of metallic bands: Tri-Link with AC/DC adapter. The worst-case configuration was investigated with wristbands with and without a charger and it was determined that EUT with Tri-Link wristband and with a charger was the worst-case; therefore, all final radiated testing was performed with this configuration.

Radiated bandedge, harmonics, and spurious emissions from 1 GHz to 18GHz were performed with EUT set to transmit at the Low/Middle/High channels.

Radiated emission below 1GHz, above 18GHz, 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 Z-Portrait orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in Z-Portrait orientation.

Worst-case data rates were:

GFSK mode: DH5
8PSK mode: 3-DH5

DQPSK mode has been verified to have the lowest output power.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID/ DoC
Laptop AC/DC Adapter	Lenovo	ADLX45DLCC2A	11S36200283ZZ10051KU2U	DoC
Laptop	Lenovo	ThinkPad X1 Carbon	R9-0G4NPM 15/06	DoC
AC/DC Adapter	Apple	A1357	N/A	DoC

I/O CABLES (CONDUCTED TEST)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Unshielded	1	AC Mains to AC/DC Adapter
2	DC	1	DC	Unshielded	1.5	AC/DC Adapter to Laptop
3	USB	1	USB	Shielded	1	Laptop to EUT
4	Antenna	1	SMA	Unshielded	0.08	To spectrum analyzer

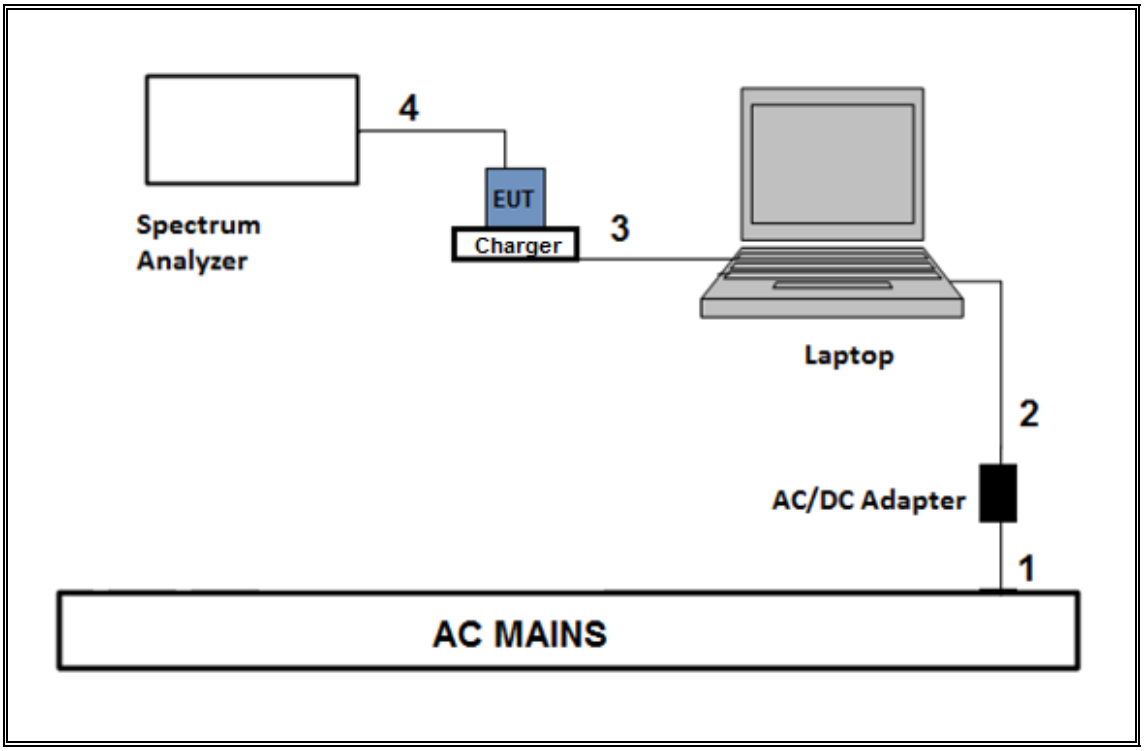
I/O CABLES (AC POWER CONDUCTED TEST AND RADIATED TEST)

I/O Cable List						
Cable No	Port	# of identical	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB	Shielded	1	Charger to AC/DC adapter

TEST SETUP-CONDUCTED TEST

The EUT was placed in charger and powered by host laptop. Test software exercised the EUT.

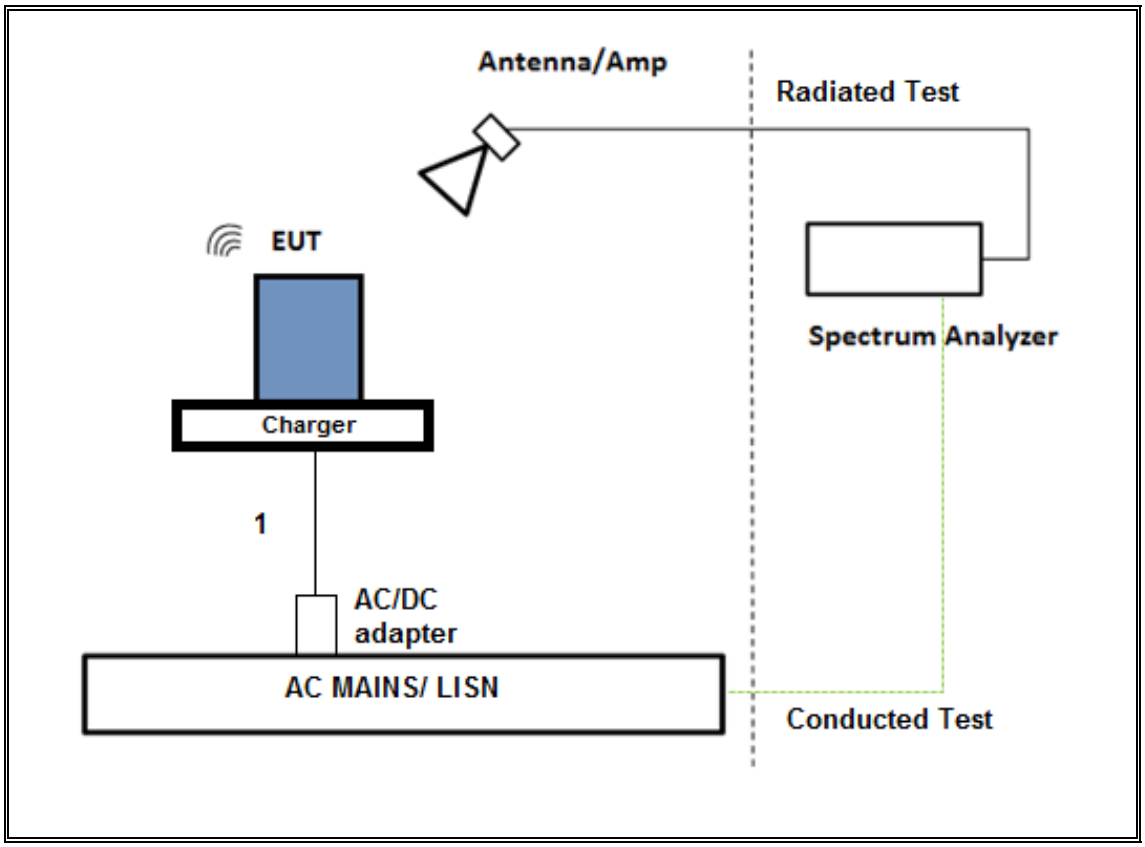
SETUP DIAGRAM



TEST SETUP- AC LINE CONDUCTED TEST AND RADIATED TEST

The EUT was placed in charger and powered by an AC/DC adapter. 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**	**Asset**	**Cal Due**
Antenna, Active Loop 9KHz to 30MHz	MICRO-TRONICS	AL-130R	PRE0165308	12/13/2018
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310N	T300	12/11/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A	T1450	02/05/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	AT0067	03/26/2019
Amplifier, 1 to 18GHz	Amplical	AMP1G18-35	T1571	06/03/2019
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB1	PRE0181575	08/01/2019
Amplifier, 30kHz-1000MHz	SONOMA INSTRUMENT	310	PRE0180174	05/31/2019
EMI Test Receiver	Rohde&Schwarz	ESW44	PRE0179372	05/04/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight	N9030A-544	T1113	12/21/2018
Antenna Horn, 18 to 26GHz	ARA	MWH-1826/B	T448	03/13/2019
Pre-Amp 1-26.5 GHz	Agilent	8449B	T404	03/09/2019
EMI Test Receiver	Rohde&Schwarz	ESW44	PRE0179376	05/08/2019
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1271	07/17/2019
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1225	04/10/2019
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1124	11/07/2018
LISN for Conducted Emissions CISPR-16	FCC INC.	FCC LISN 50/250	T1310	06/15/2019
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, June 22, 2018	
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016	
Antenna Port Software	UL	UL RF	Ver 8.8.1, Sep 26, 2018	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

NOTES:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

7. MEASUREMENT METHODS

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6

Occupied BW (20dB): ANSI C63.10-2013 Section 6.9.2

Occupied BW (99%): ANSI C63.10-2013 Section 6.9.3

Carrier Frequency Separation: ANSI C63.10-2013 Section 7.8.2

Number of Hopping Frequencies: ANSI C63.10-2013 Section 7.8.3

Time of Occupancy (Dwell Time): ANSI C63.10-2013 Section 7.8.4

Peak Output Power: ANSI C63.10-2013 Section 7.8.5

Conducted Spurious Emissions: ANSI C63.10-2013 Section 7.8.8

Conducted Band-Edge: ANSI C63.10-2013 Section 6.10.4

Radiated Spurious Emissions 30-1000MHz: ANSI C63.10-2013 Section 6.3 and 6.5

Radiated Spurious Emissions above 1GHz: ANSI C63.10-2013 Section 6.3 and 6.6

Radiated Band-edge: ANSI C63.10-2013 Section 6.10.5

AC Power-line conducted emissions: ANSI C63.10-2013, Section 6.2.

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

PROCEDURE

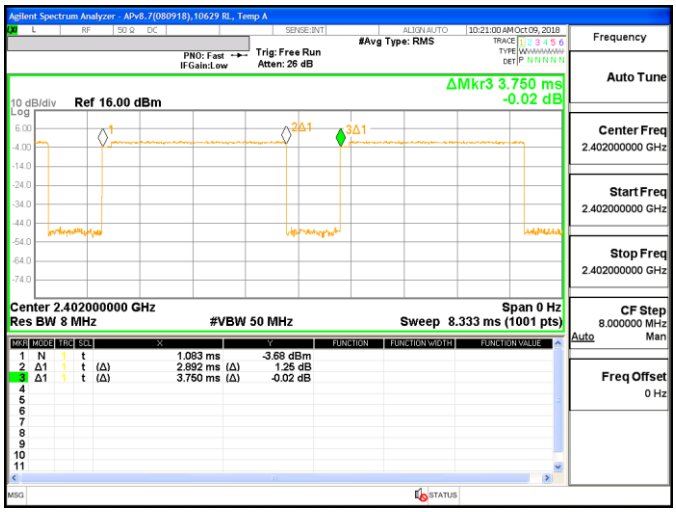
ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

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)
GFSK	2.892	3.750	0.771	77.12%	1.13	0.346
8PSK	2.892	3.750	0.771	77.12%	1.13	0.346

HOPPING OFF

GFSK



8PSK

8.2. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

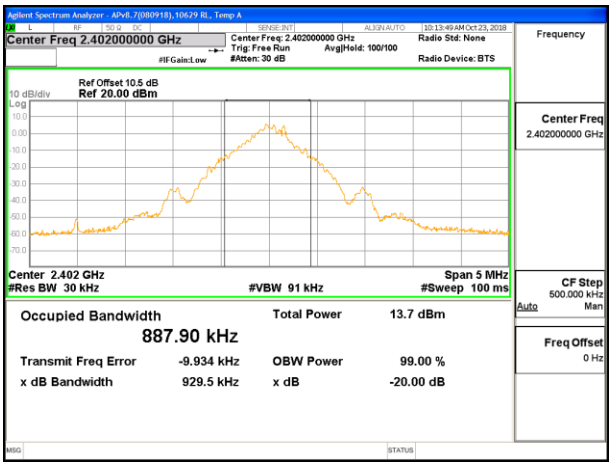
TEST PROCEDURE

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.

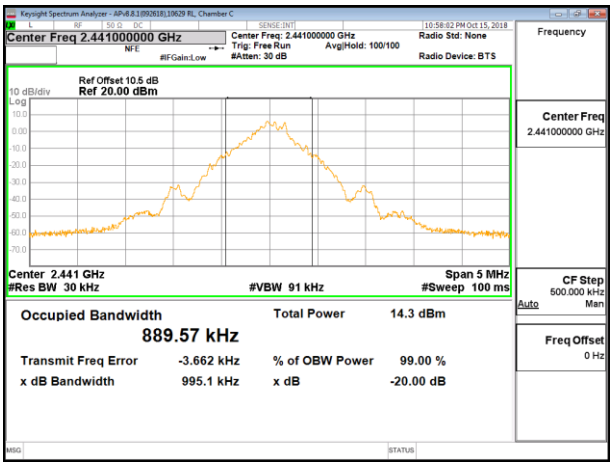
RESULTS

8.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

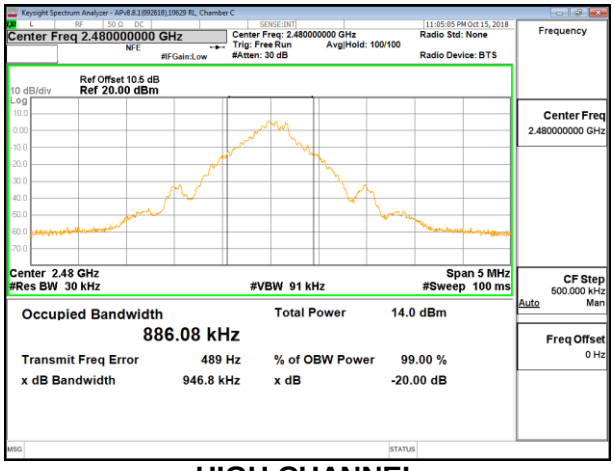
Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2402	929.5	887.90
Middle	2441	995.1	889.57
High	2480	946.8	886.08



LOW CHANNEL



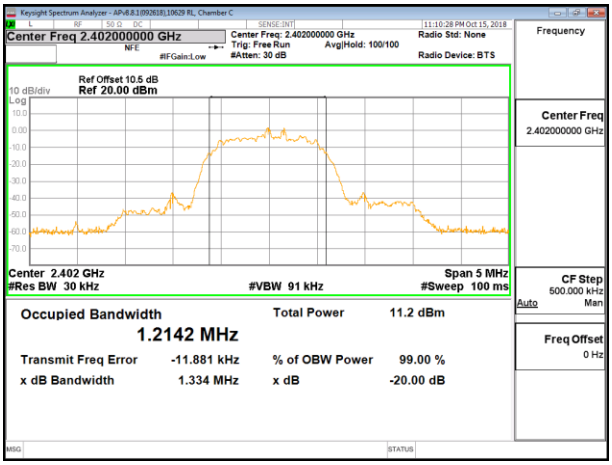
MID CHANNEL



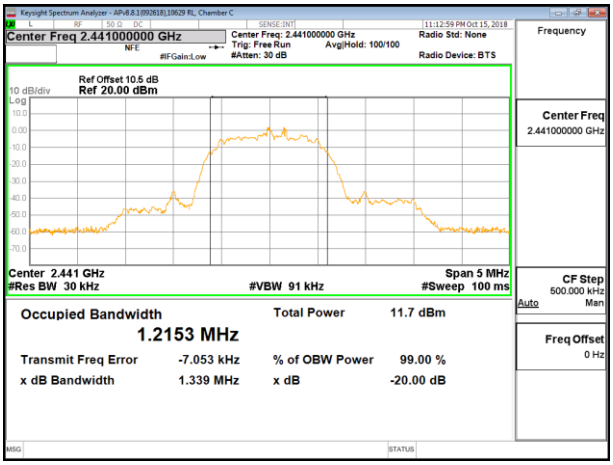
HIGH CHANNEL

8.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

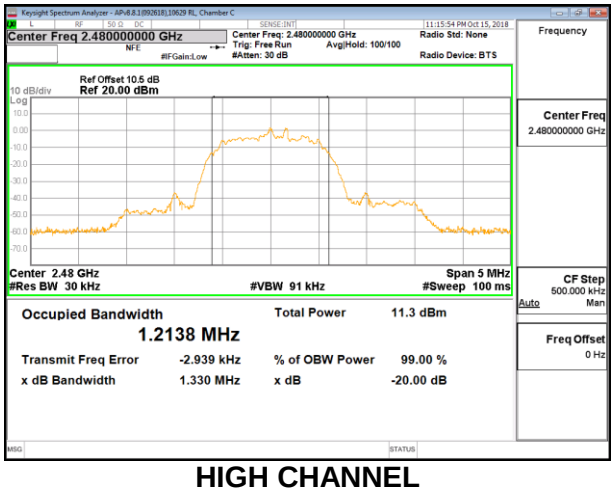
Channel	Frequency (MHz)	20 dB Bandwidth (KHz)	99% Bandwidth (KHz)
Low	2402	1334	1214.2
Middle	2441	1339	1215.3
High	2480	1330	1213.8



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

8.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

IC RSS-247 (5.1) (b)

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

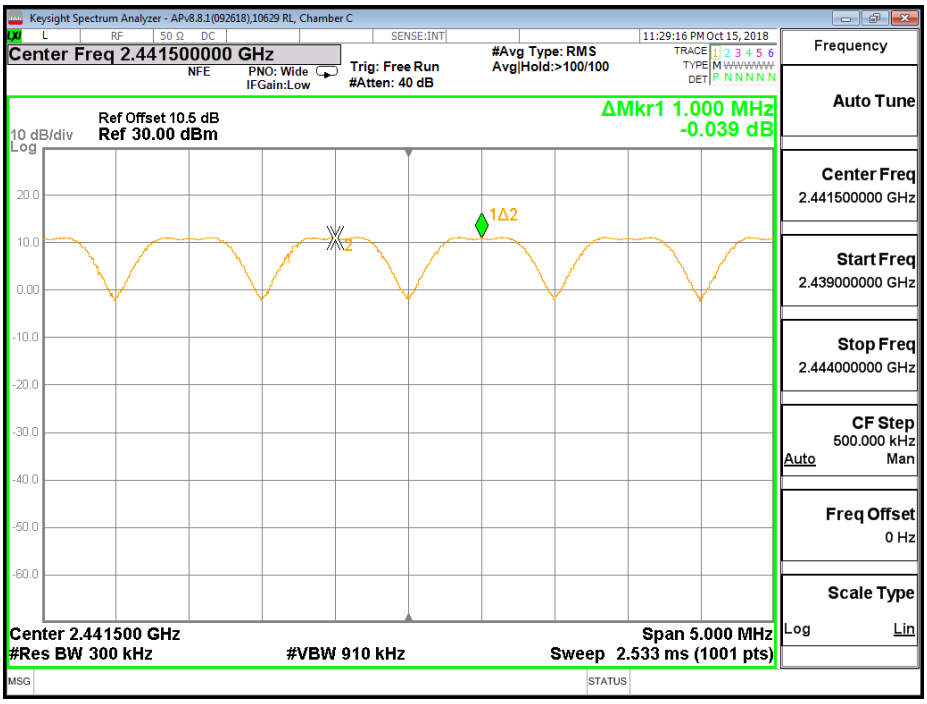
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

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

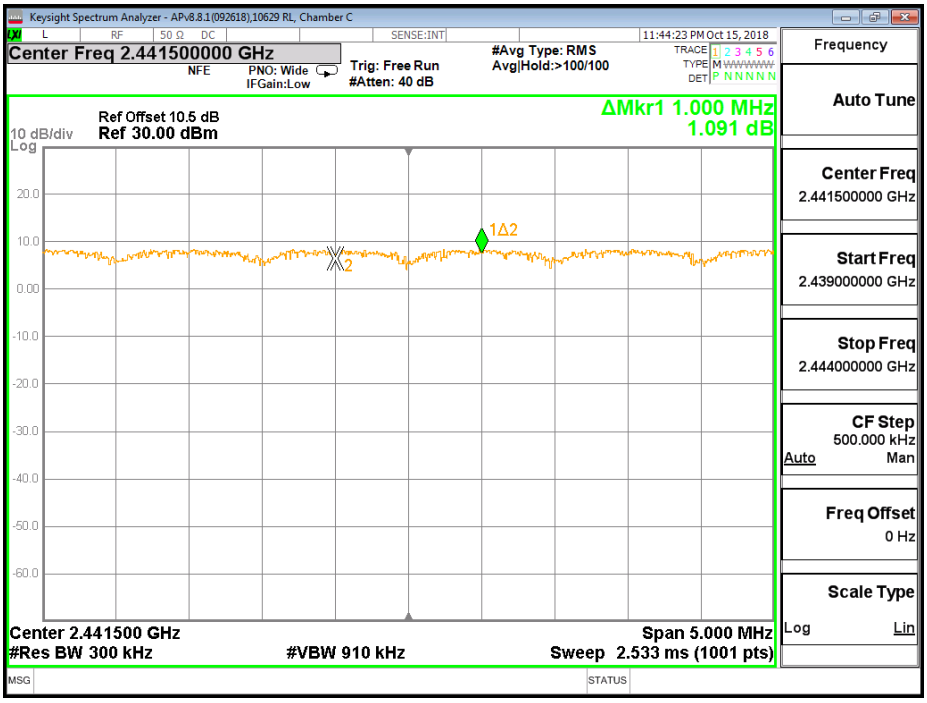
RESULTS

8.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

8.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

8.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

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

TEST PROCEDURE

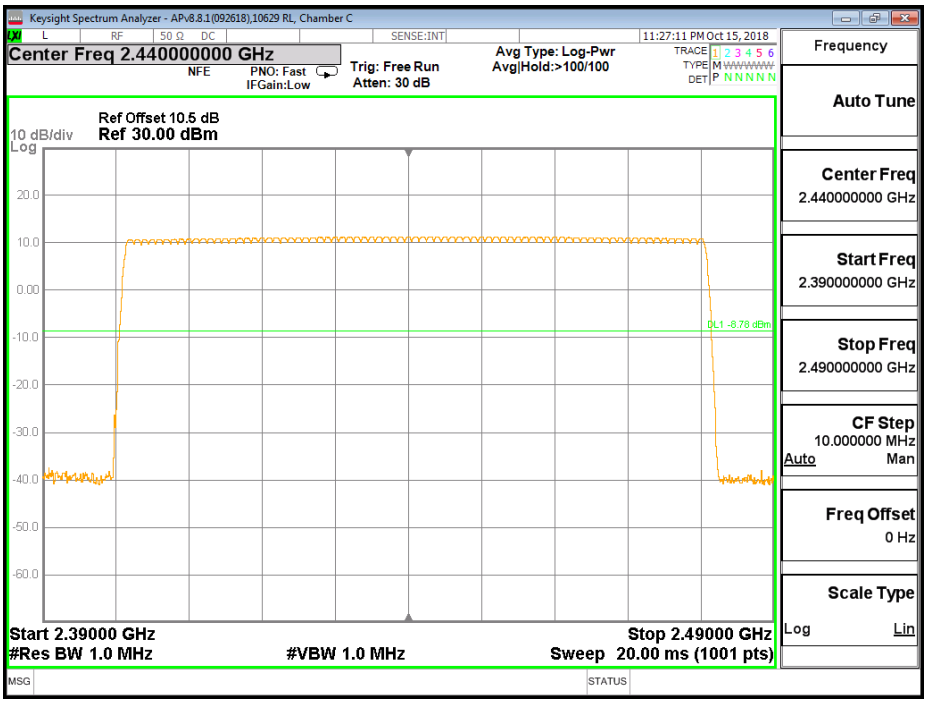
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

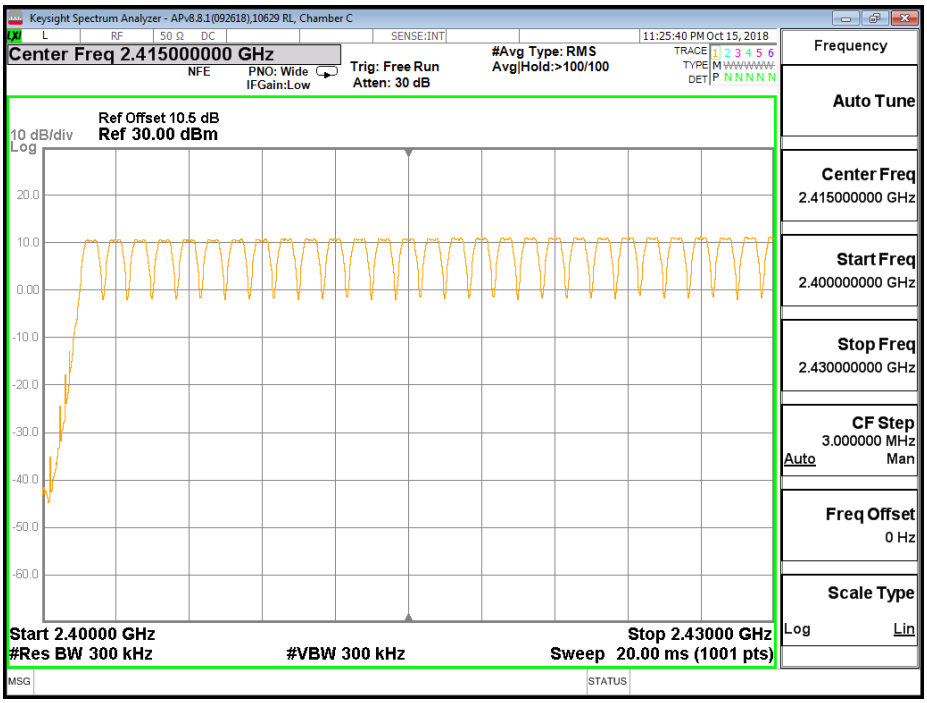
Normal Mode: 79 Channels observed

8.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

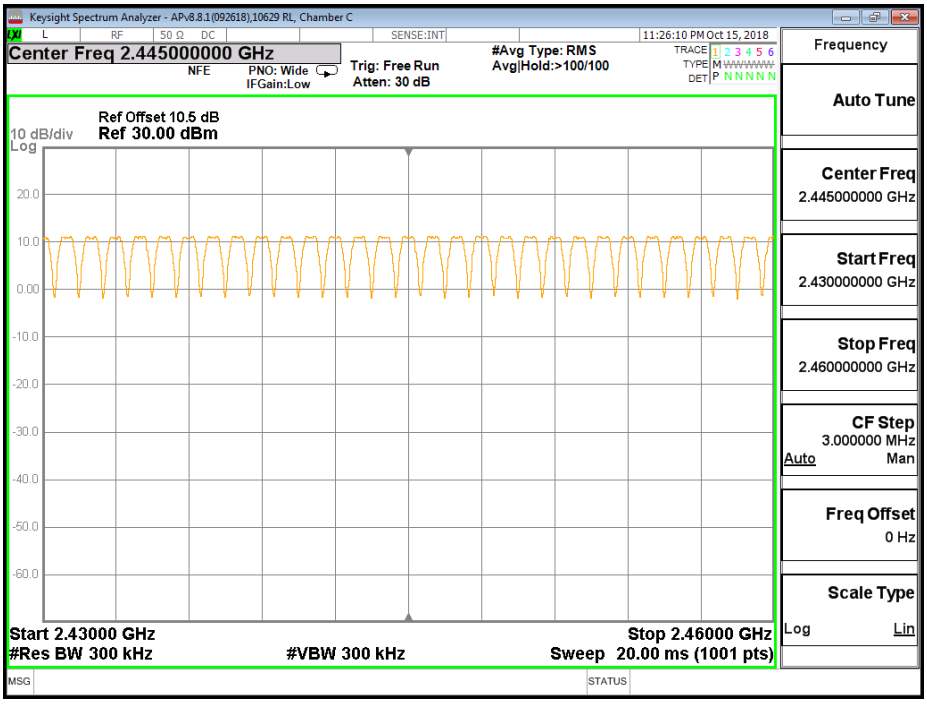
Normal Mode: 79 Channels observed.



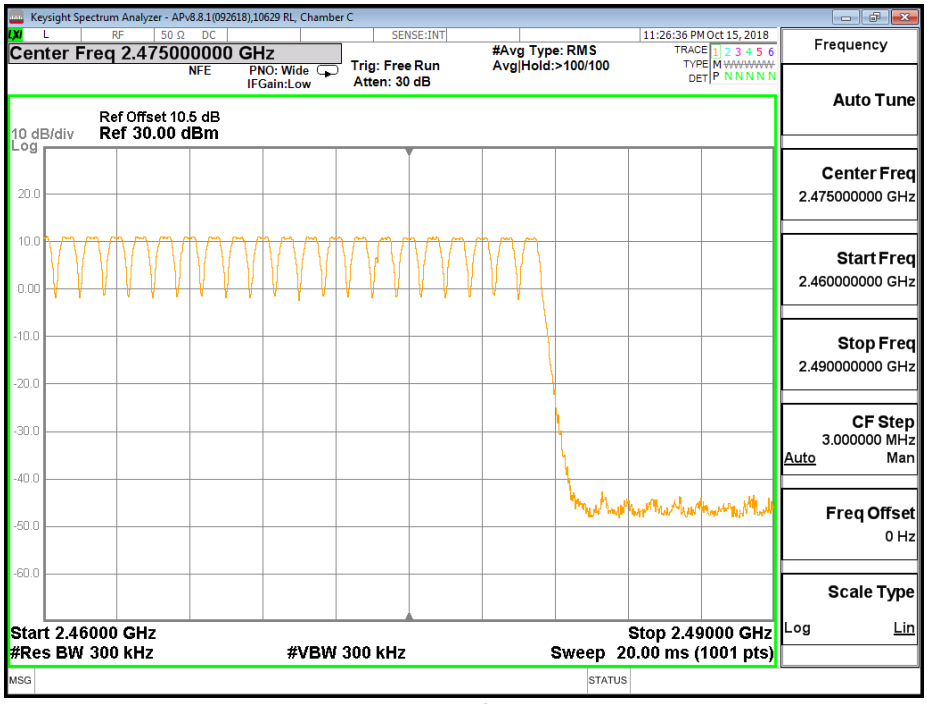
NUMBER OF HOPPING CHANNELS (100 MHz SPAN)



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



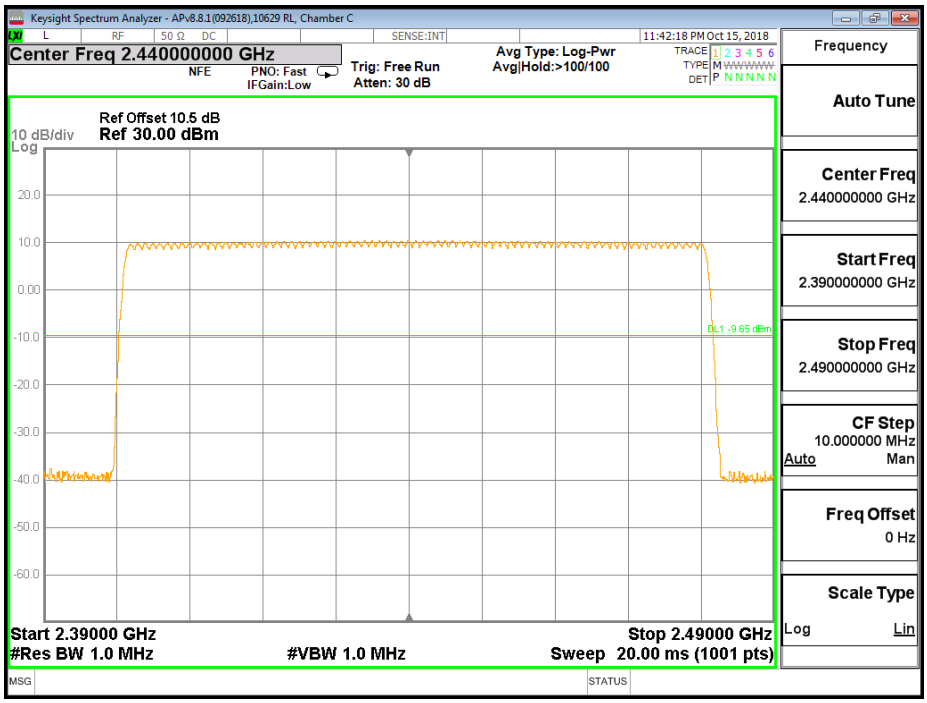
NUMBER OF HOPPING CHANNELS (30 MHz SPAN, SECOND SEGMENT)



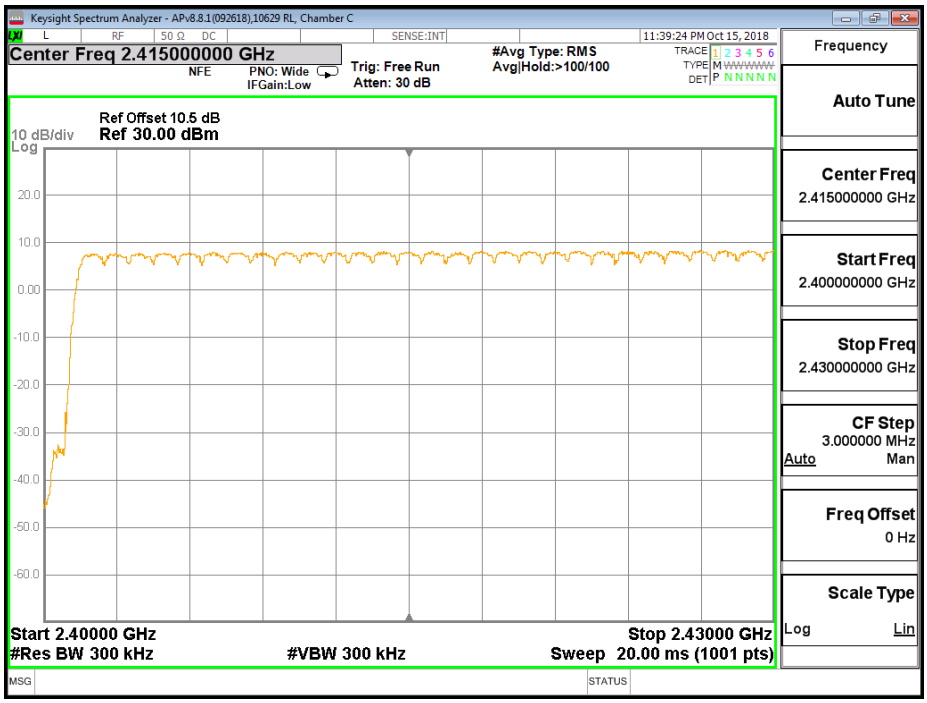
NUMBER OF HOPPING CHANNELS (30 MHz SPAN, THIRD SEGMENT)

8.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

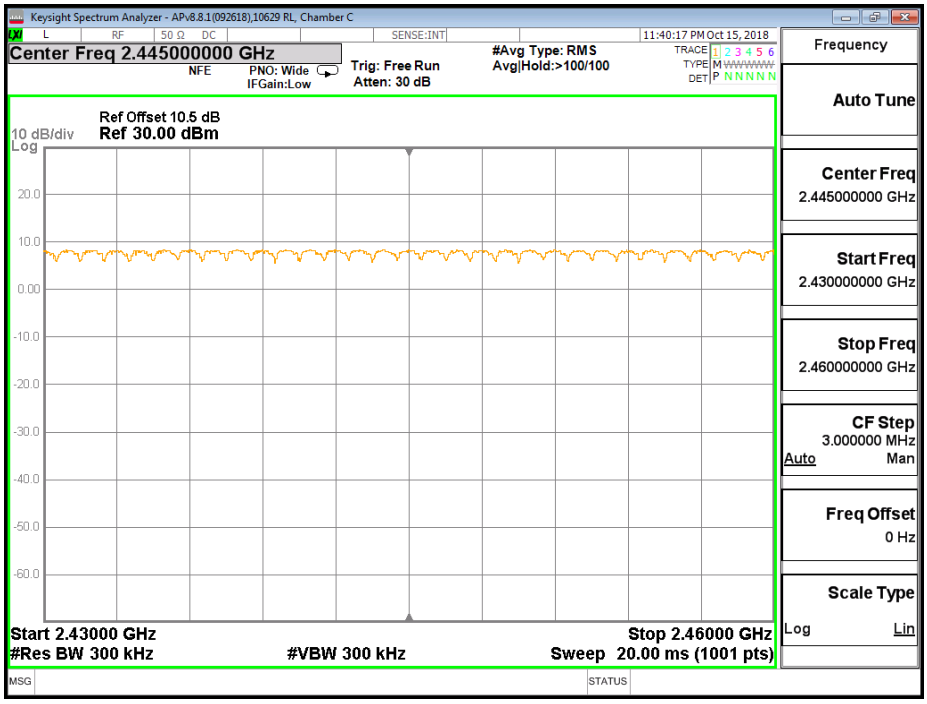
Normal Mode: 79 Channels observed.



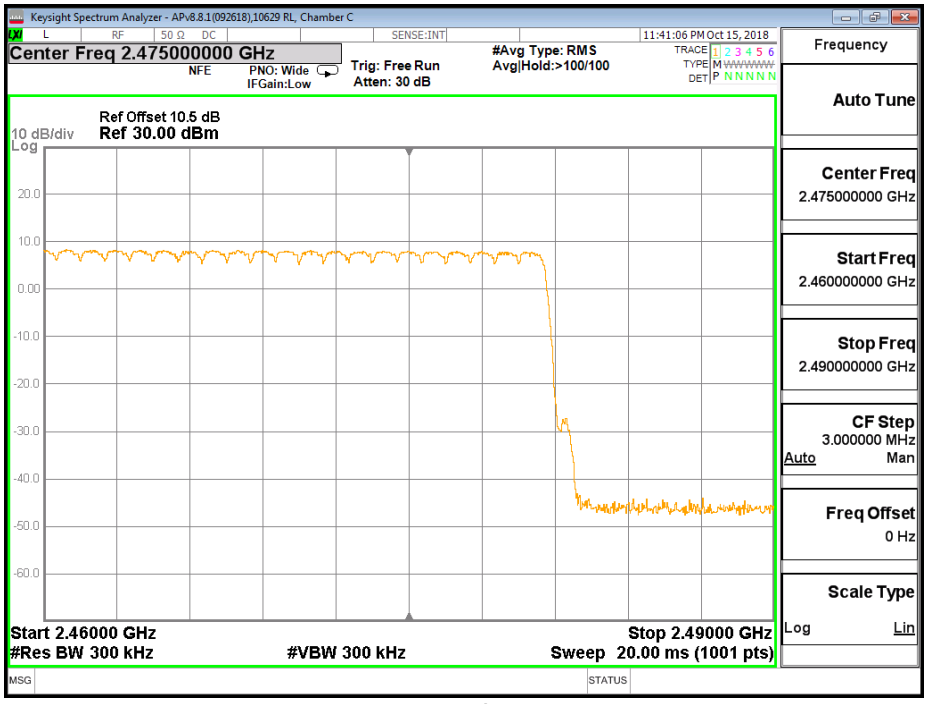
NUMBER OF HOPPING CHANNELS (100 MHz SPAN)



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)

8.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

IC RSS-247 (5.1) (d)

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

TEST PROCEDURE

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

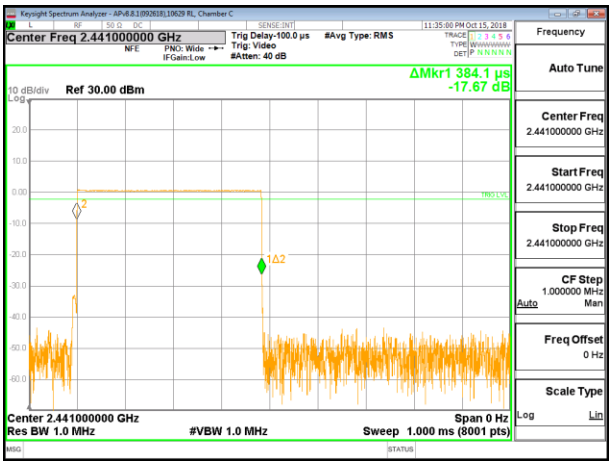
The average time of occupancy in the specified 31.6 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

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.

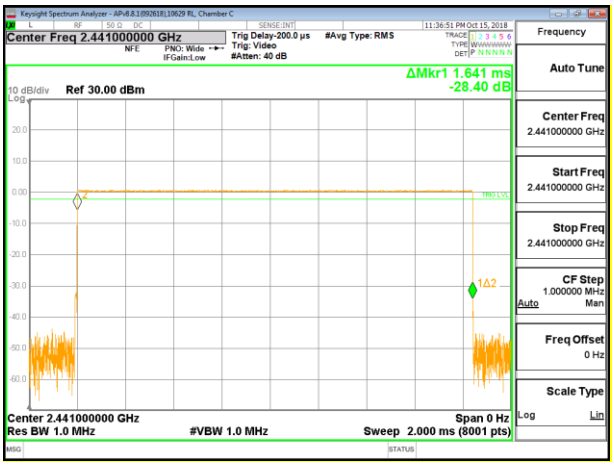
RESULTS

8.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

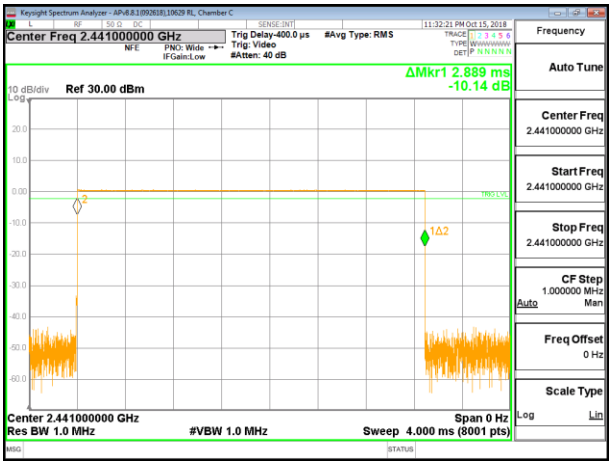
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.384	32	0.123	0.4	-0.277
DH3	1.641	17	0.279	0.4	-0.121
DH5	2.889	10	0.289	0.4	-0.111
DH Packet	**Pulse Width (msec)**	**Number of Pulses in 0.8 seconds**	**Average Time of Occupancy (sec)**	**Limit (sec)**	**Margin (sec)**
GFSK AFH Mode					
DH1	0.384	8	0.031	0.4	-0.369
DH3	1.641	4.25	0.070	0.4	-0.330
DH5	2.889	2.5	0.072	0.4	-0.328



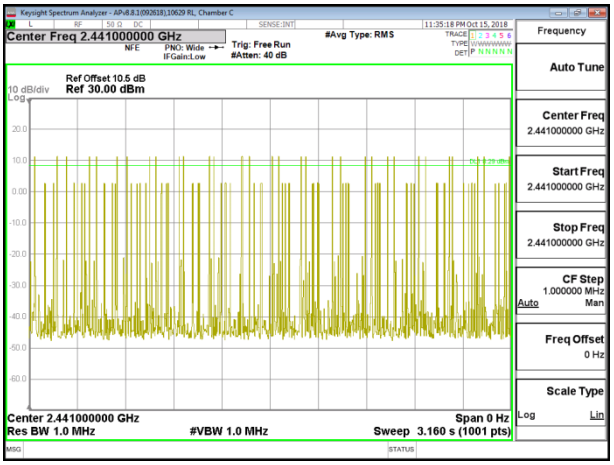
PULSE WIDTH – DH1



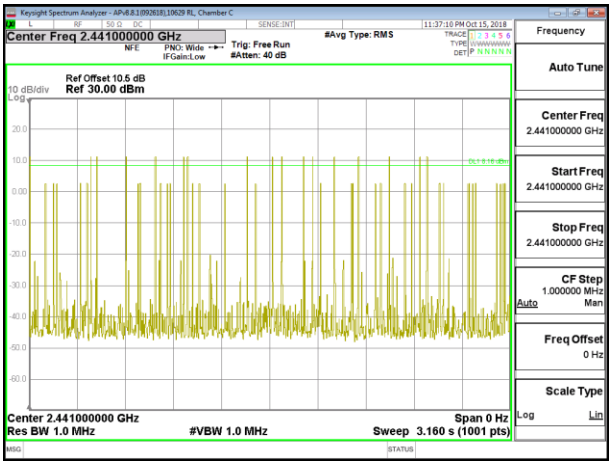
PULSE WIDTH – DH3



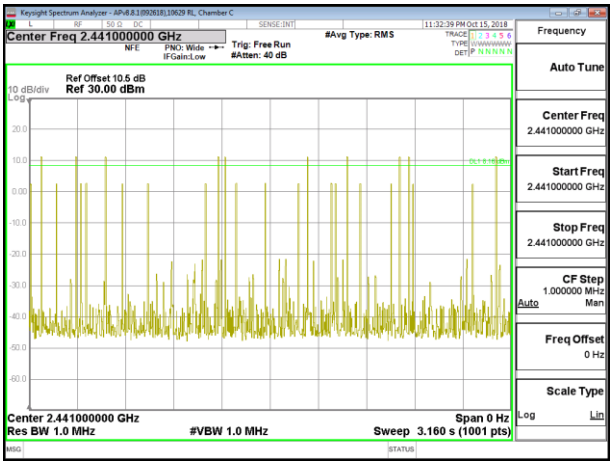
PULSE WIDTH – DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3

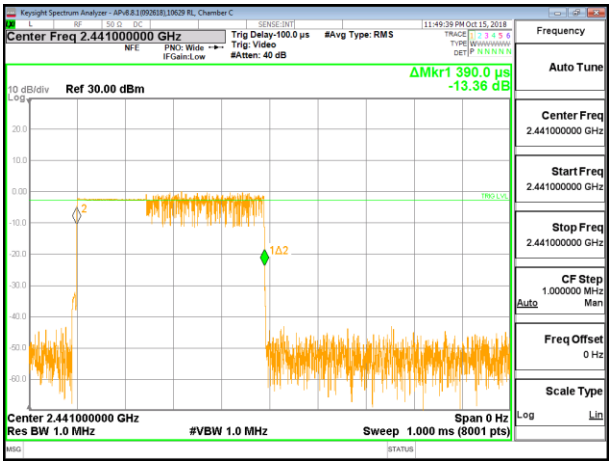


NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

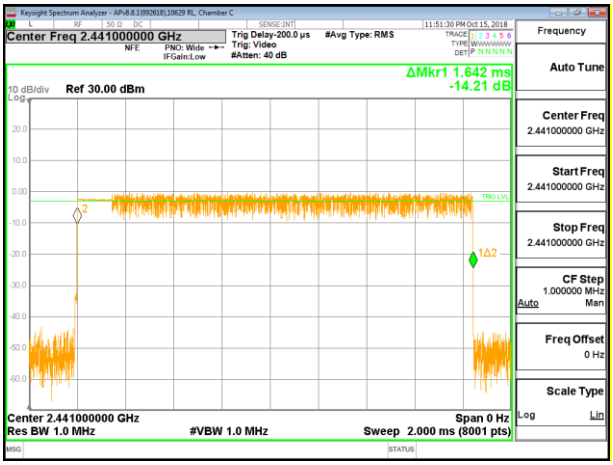
8.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK (EDR) Mode					
3DH1	0.39	32	0.125	0.4	-0.275
3DH3	1.642	18	0.296	0.4	-0.104
3DH5	2.893	13	0.376	0.4	-0.024

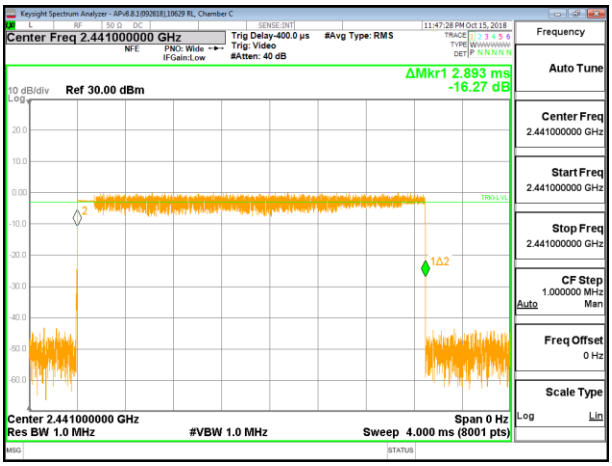
Note: for AFH (8PSK) mode, please refer to the results of AFH (GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate in section 8.5.1 demonstrates compliance with channel occupancy when AFH is employed.



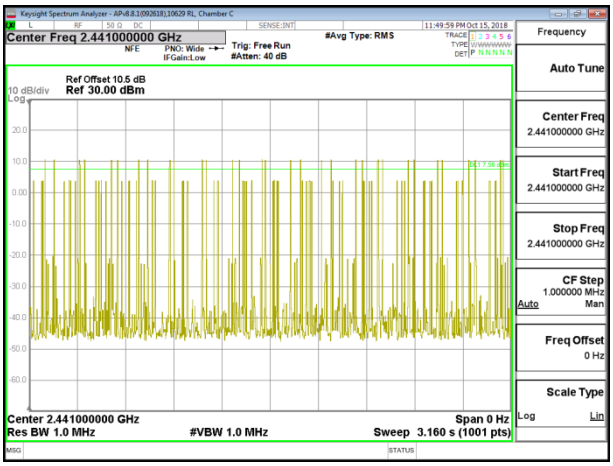
PULSE WIDTH – 3DH1



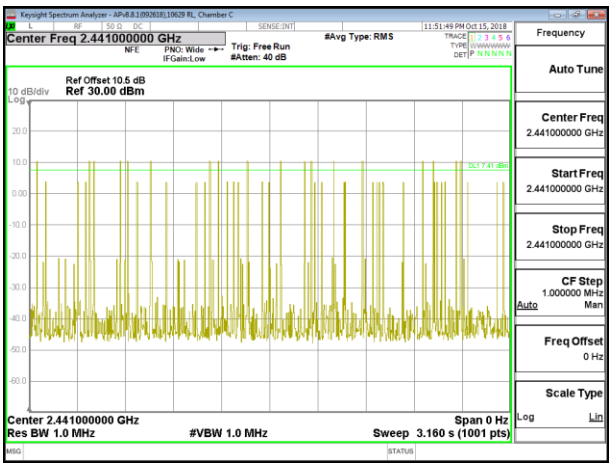
PULSE WIDTH – 3DH3



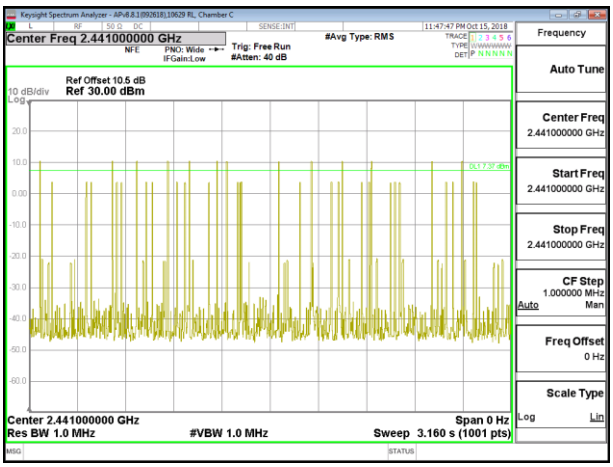
PULSE WIDTH – 3DH5



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH1



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3DH5

8.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)

RSS-247 (5.4) (b)

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

Measurements perform using a wideband gated RF power meter.

RESULTS

ID:	43573	Date:	11/19/2018

8.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.83	30	-19.17
Middle	2441	11.23	30	-18.77
High	2480	10.70	30	-19.30

8.6.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.10	21	-10.90
Middle	2441	10.23	21	-10.77
High	2480	9.81	21	-11.19

8.6.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	10.00	21	-11.00
Middle	2441	10.65	21	-10.35
High	2480	9.87	21	-11.13

8.7. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.

The cable assembly insertion loss of 10.3 dB (including 10 dB pad and 0.3 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

ID:	43573	**Date:**	11/19/2018

8.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	10.61
Middle	2441	11.01
High	2480	10.43

8.7.2. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.80
Middle	2441	8.19
High	2480	7.47

8.7.3. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	7.53
Middle	2441	8.24
High	2480	7.60

8.8. CONDUCTED BANDEDGE AND 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.

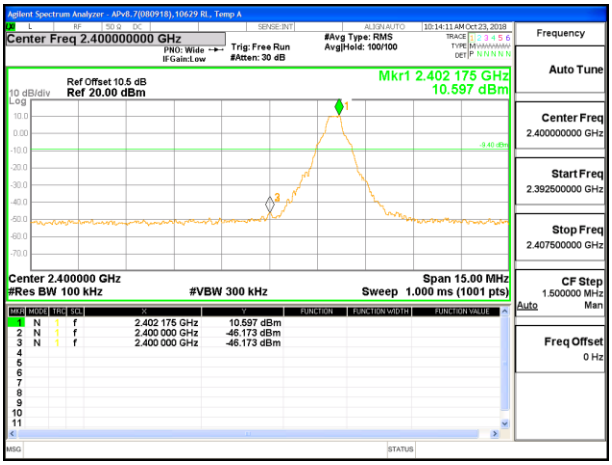
The bandedges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

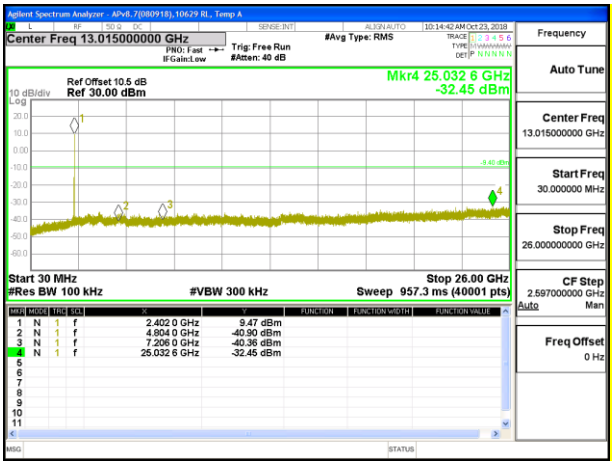
ID:	10629	Date:	10/15/2018

8.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

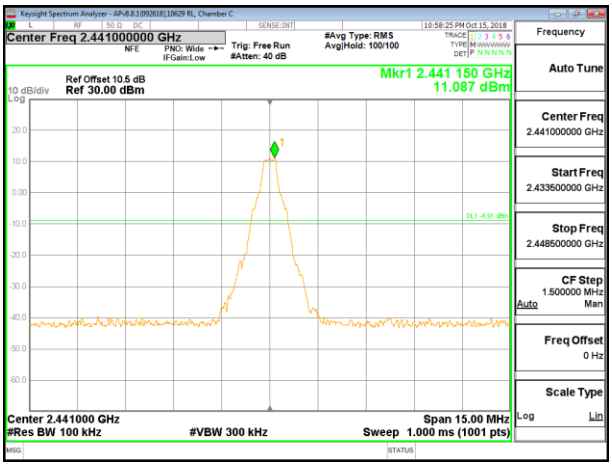
NON-HOPPING



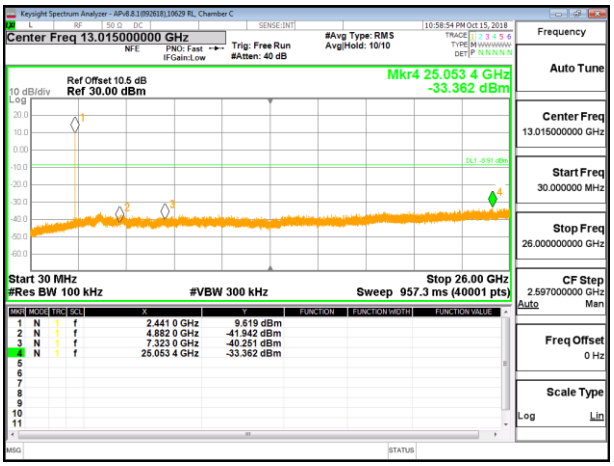
LOW CHANNEL BANDEDGE



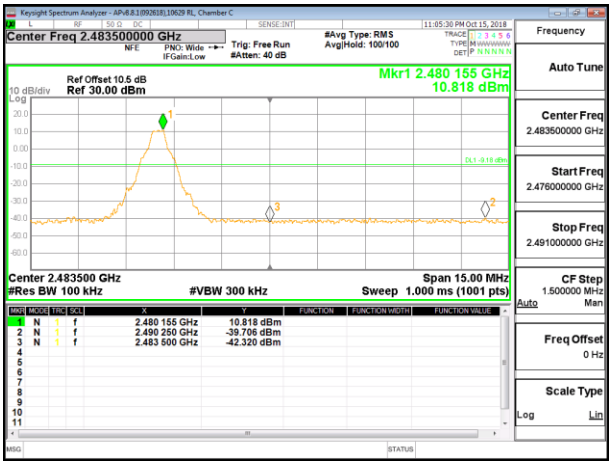
OUT-OF-BAND LOW CHANNEL



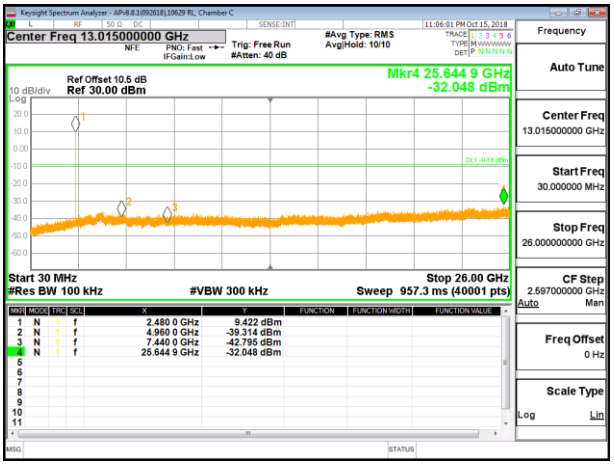
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

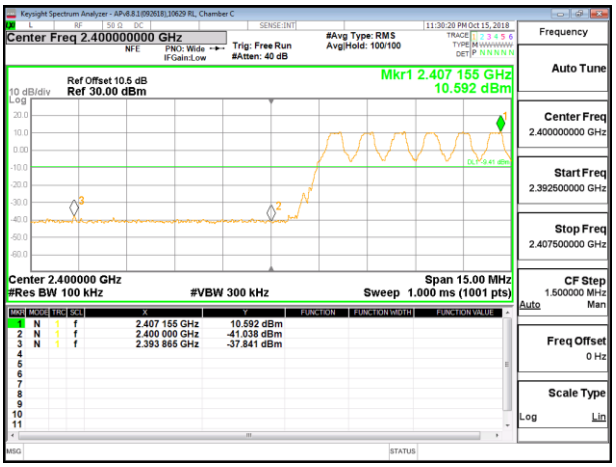


HIGH CHANNEL BANDEDGE

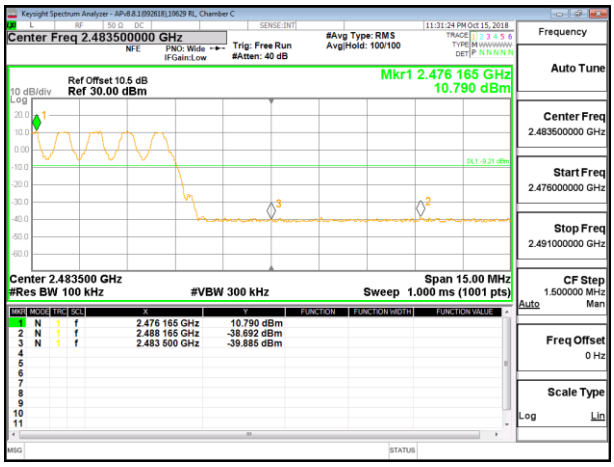


OUT-OF-BAND HIGH CHANNEL

WITH HOPPING ON



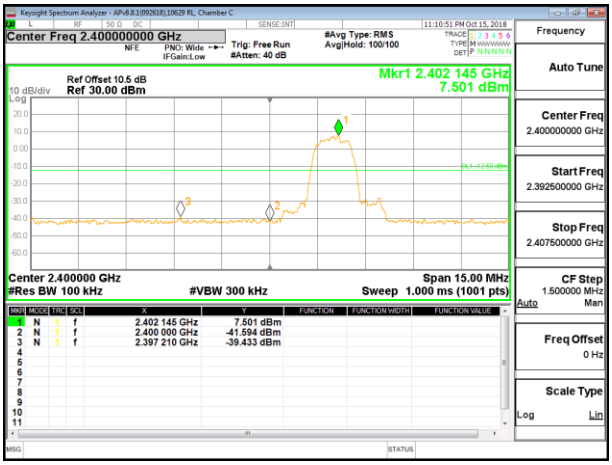
LOW BANDEDGE



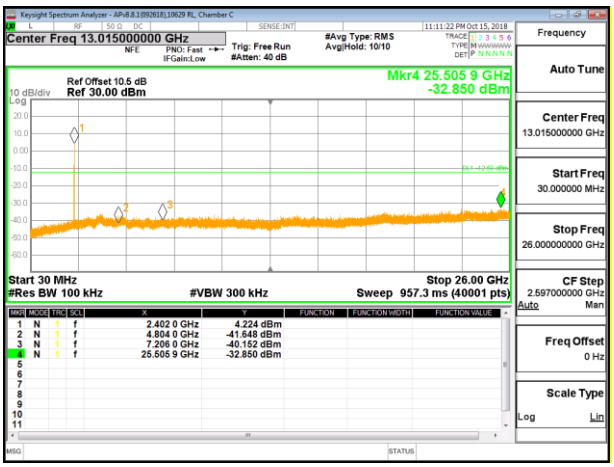
HIGH BANDEDGE

8.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

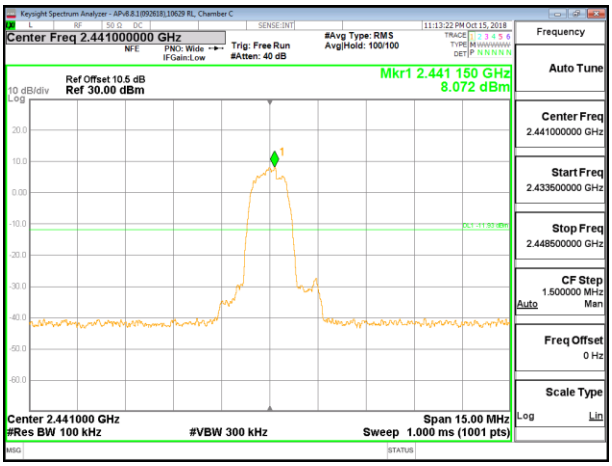
NON-HOPPING



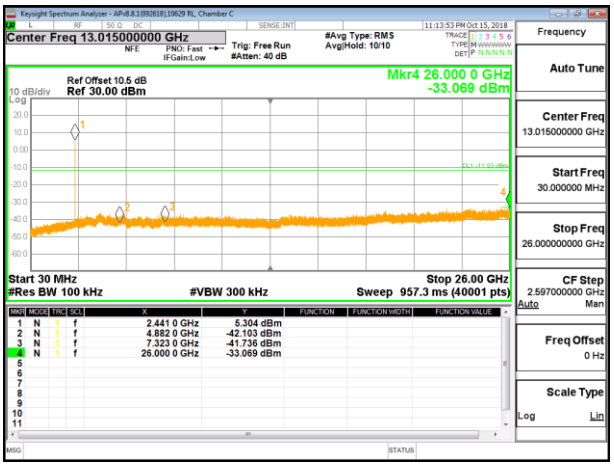
LOW CHANNEL BANDEDGE



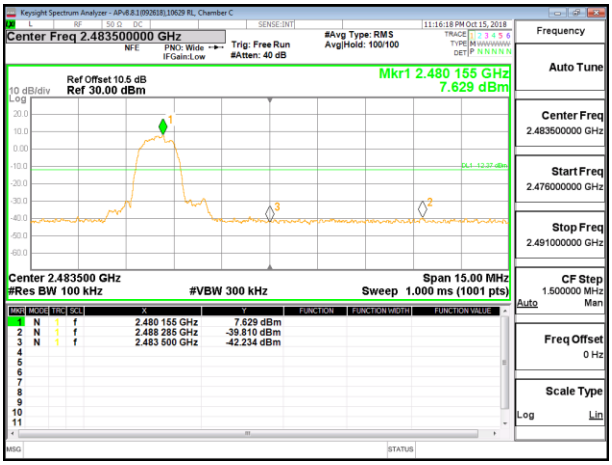
OUT-OF-BAND LOW CHANNEL



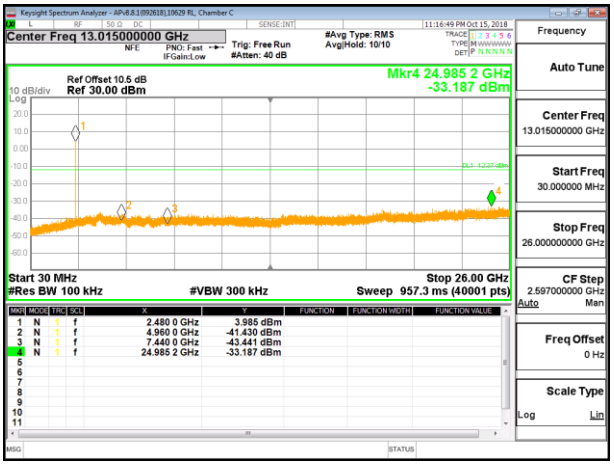
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

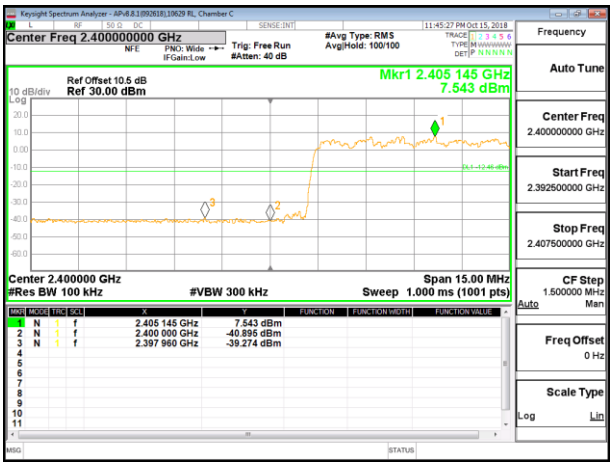


HIGH CHANNEL BANDEDGE

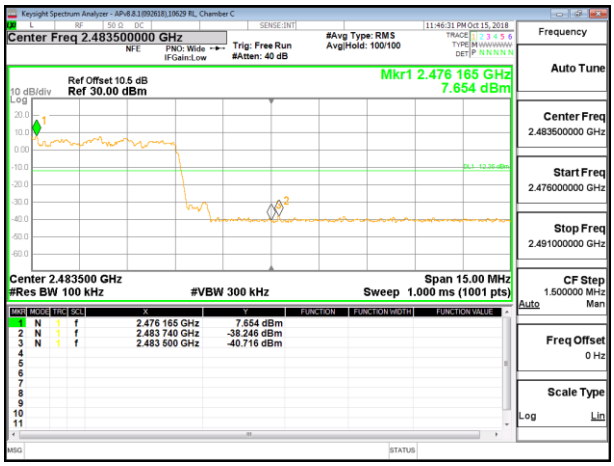


OUT-OF-BAND HIGH CHANNEL

WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

9. RADIATED TEST RESULTS

9.1. 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
0.009-0.490	2400/F(kHz) @ 300m	-
0.490-1.705	24000/F(kHz) @ 30m	-
1.705-30.0	30 @ 30m	30 @ 30m
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 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.

For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.

KDB 414788 OATS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

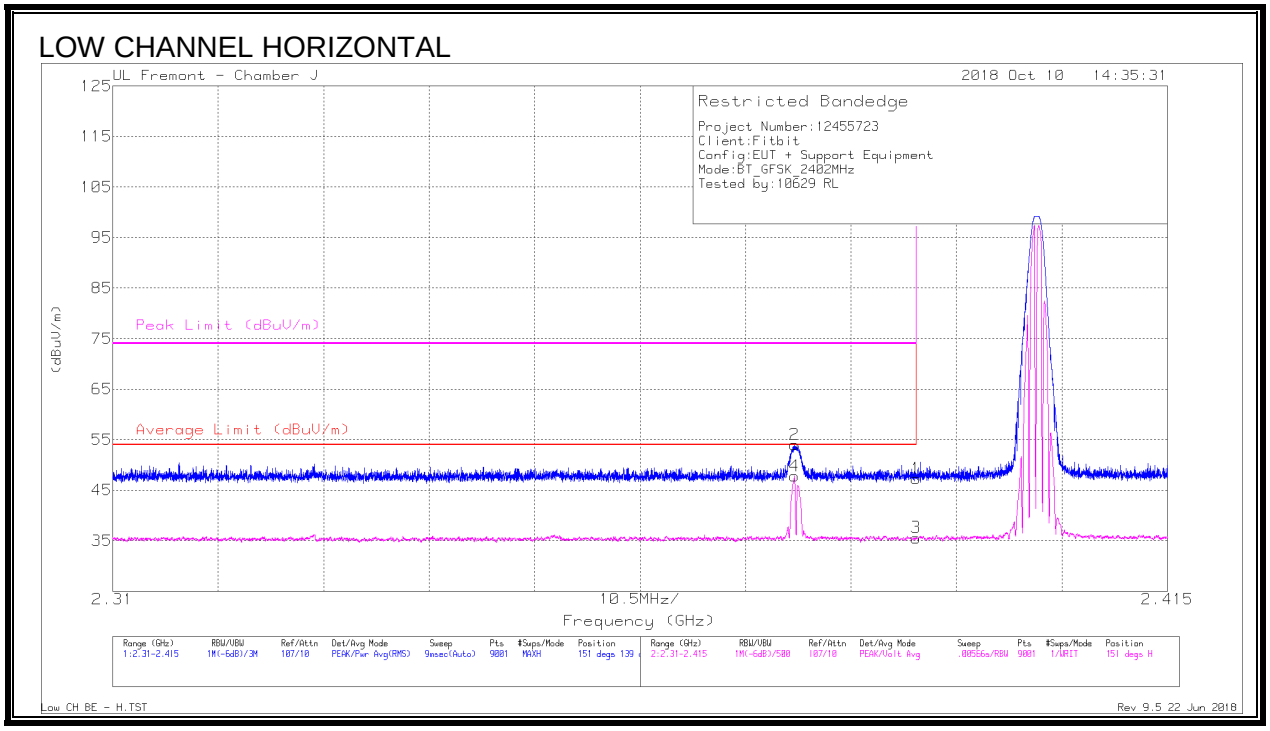
OATs and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

RESULTS

9.2. TRANSMITTER ABOVE 1 GHz

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

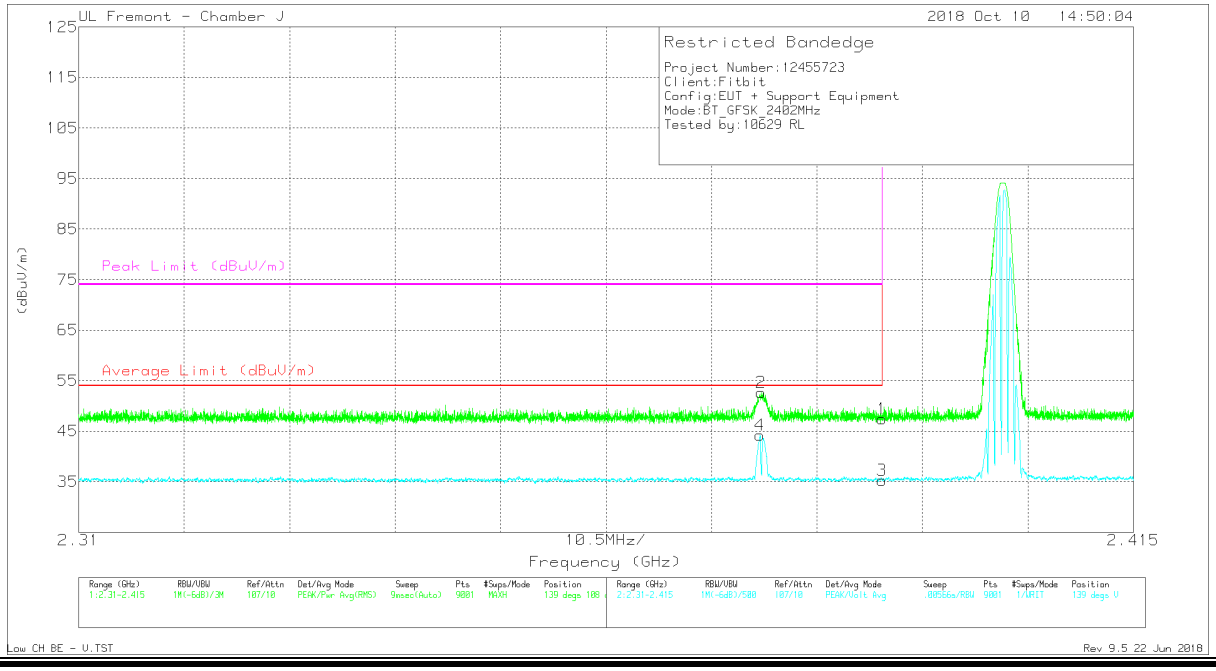


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (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	41.13	Pk	32	-25.8	47.33	-	-	74	-26.67	151	139	H
2	* 2.378	47.86	Pk	32	-25.8	54.06	-	-	74	-19.94	151	139	H
3	* 2.39	29.38	VA1T	32	-25.8	35.58	54	-18.42	-	-	151	139	H
4	* 2.378	41.57	VA1T	32	-25.8	47.77	54	-6.23	-	-	151	139	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

LOW CHANNEL VERTICAL

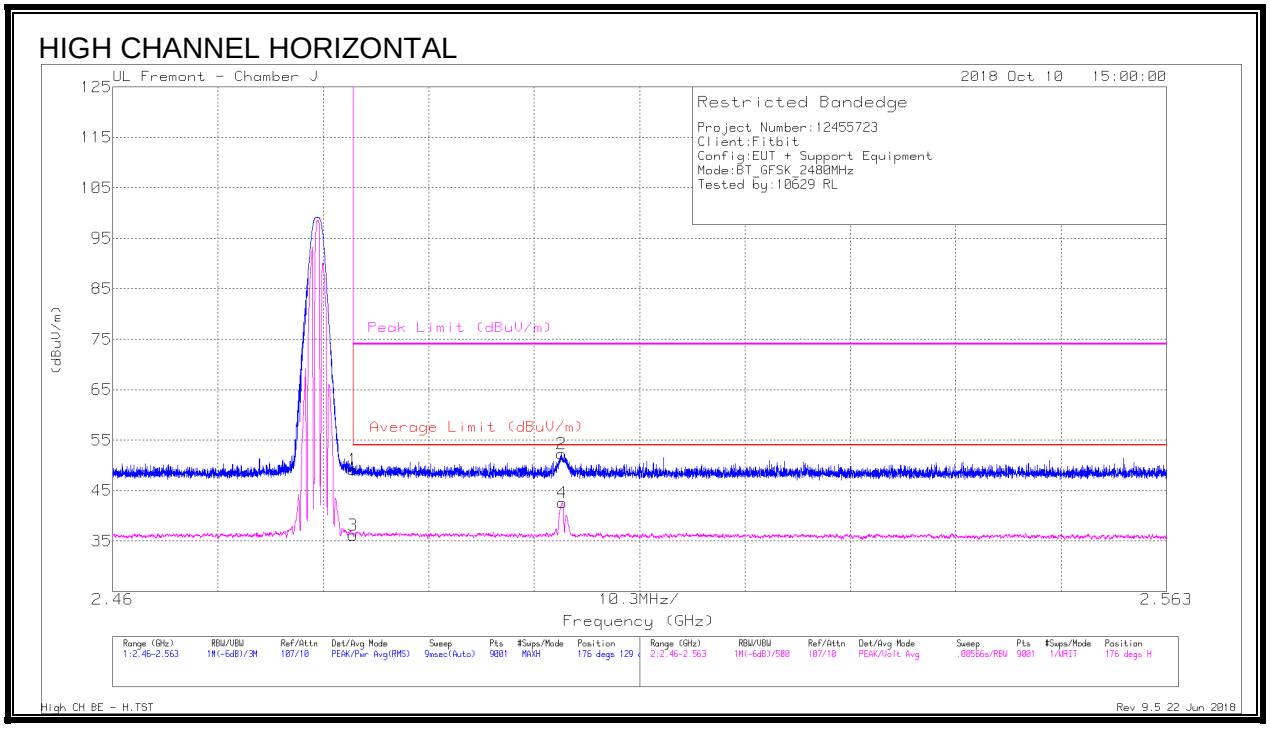


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (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	41.21	Pk	32	-25.8	47.41	-	-	74	-26.59	139	108	V
2	* 2.378	46.48	Pk	32	-25.8	52.68	-	-	74	-21.32	139	108	V
3	* 2.39	29.07	VA1T	32	-25.8	35.27	54	-18.73	-	-	139	108	V
4	* 2.378	37.96	VA1T	32	-25.8	44.16	54	-9.84	-	-	139	108	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

AUTHORIZED BANDEDGE (HIGH CHANNEL)

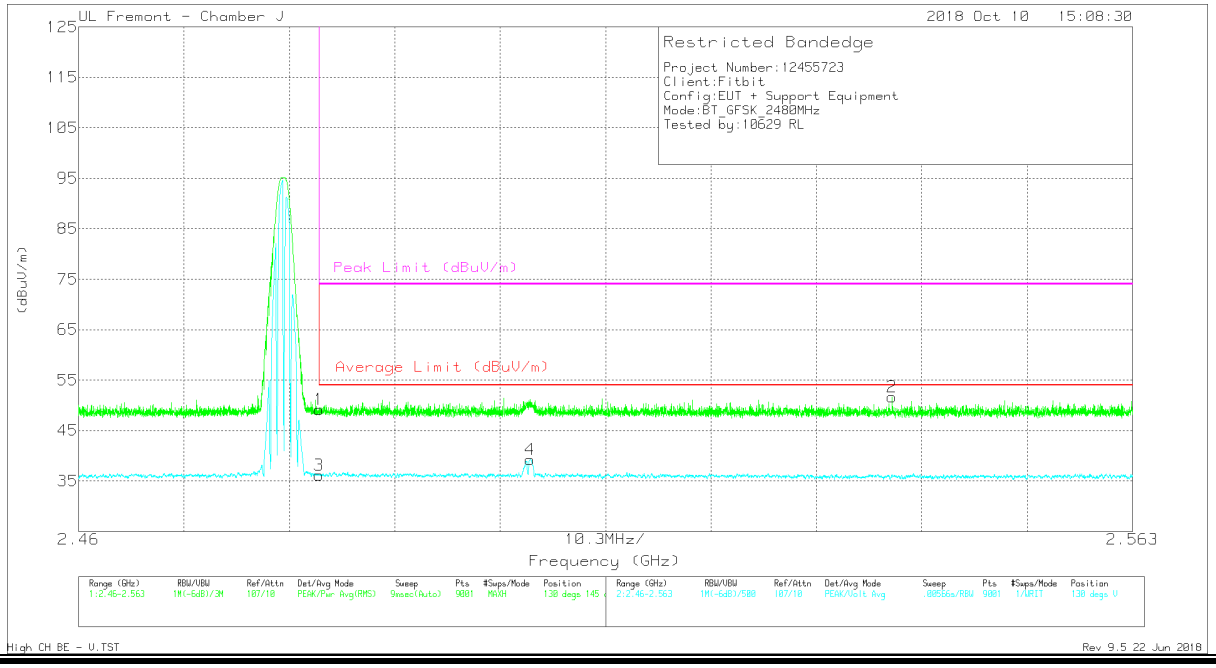


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (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	42.49	Pk	32.5	-25.8	49.19	-	-	74	-24.81	176	129	H
2	2.504	45.6	Pk	32.5	-25.8	52.3	-	-	74	-21.7	176	129	H
3	* 2.484	29.47	VA1T	32.5	-25.8	36.17	54	-17.83	-	-	176	129	H
4	2.504	35.91	VA1T	32.5	-25.8	42.61	54	-11.39	-	-	176	129	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

HIGH CHANNEL VERTICAL



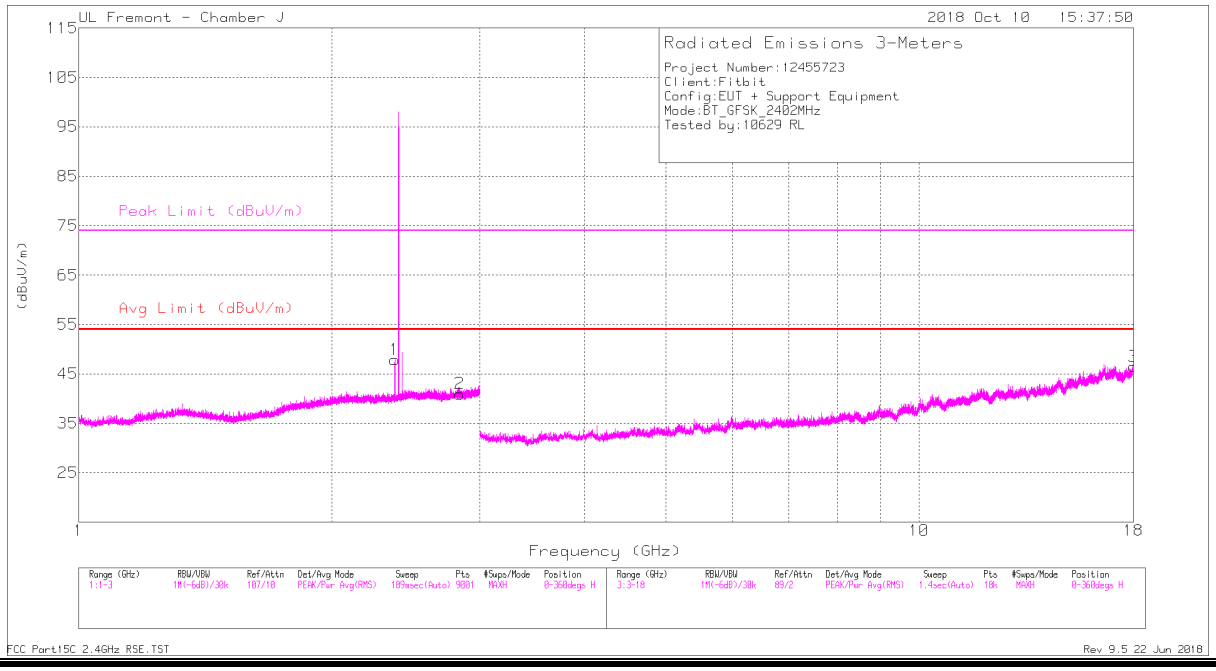
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (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	42.46	Pk	32.5	-25.8	49.16	-	-	74	-24.84	130	145	V
2	2.54	44.86	Pk	32.5	-25.7	51.66	-	-	74	-22.34	130	145	V
3	* 2.484	29.46	VA1T	32.5	-25.8	36.16	54	-17.84	-	-	130	145	V
4	2.504	32.52	VA1T	32.5	-25.8	39.22	54	-14.78	-	-	130	145	V

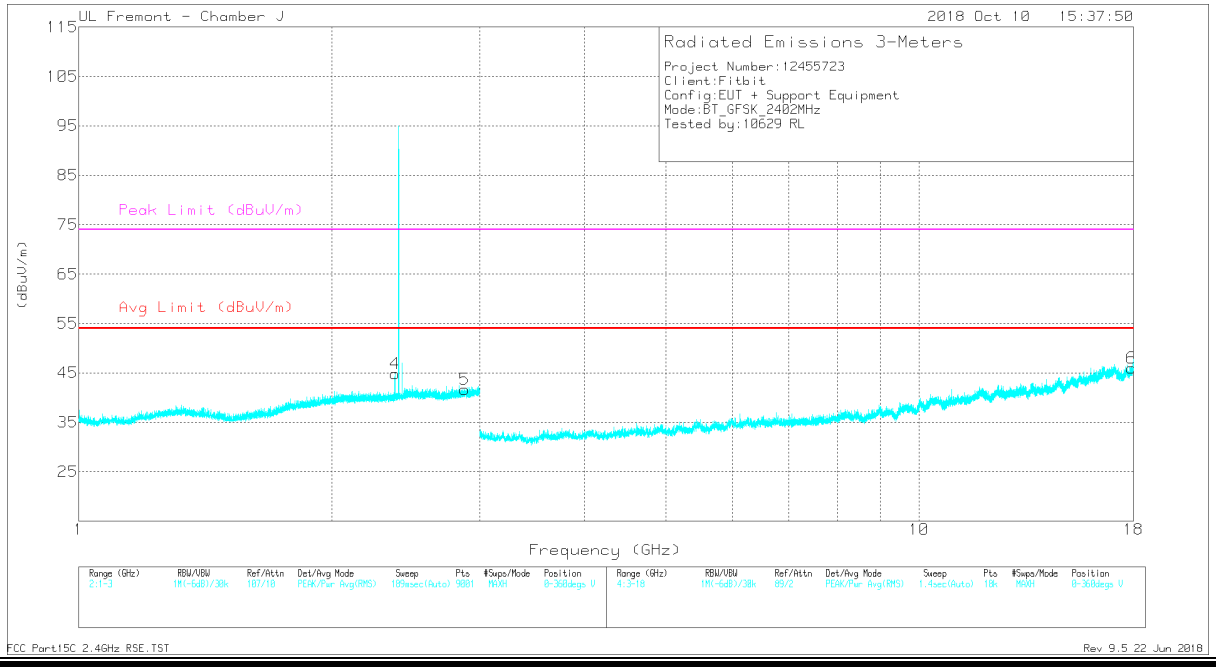
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL

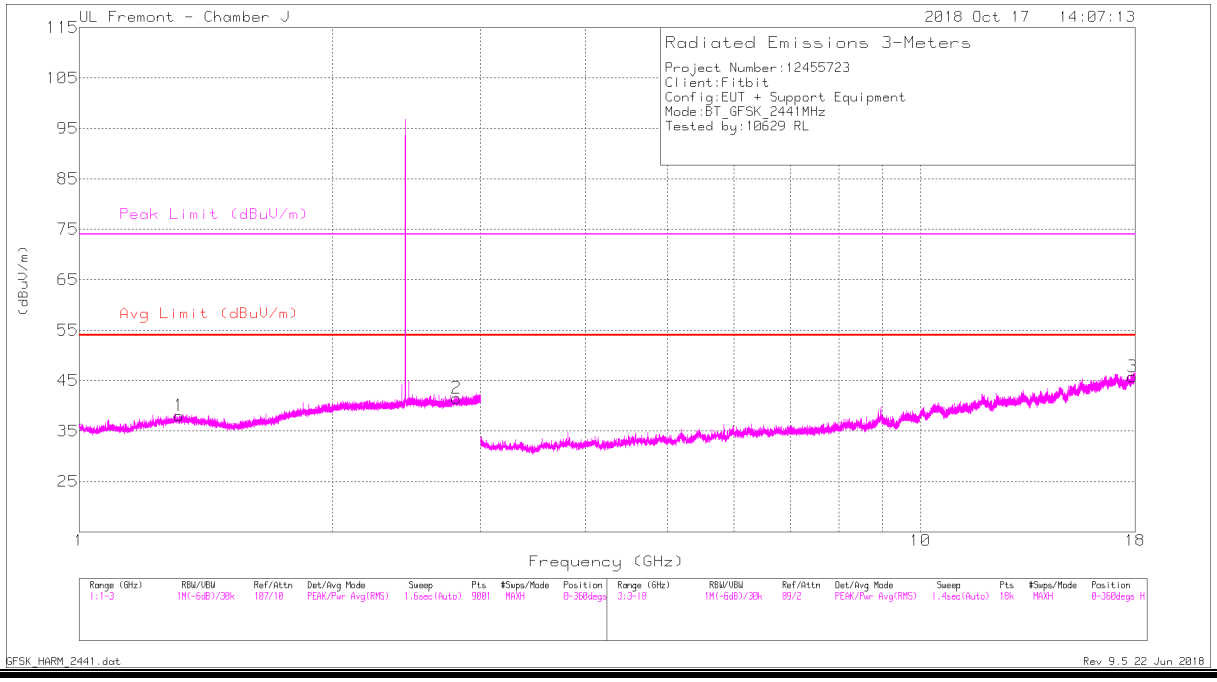


DATA

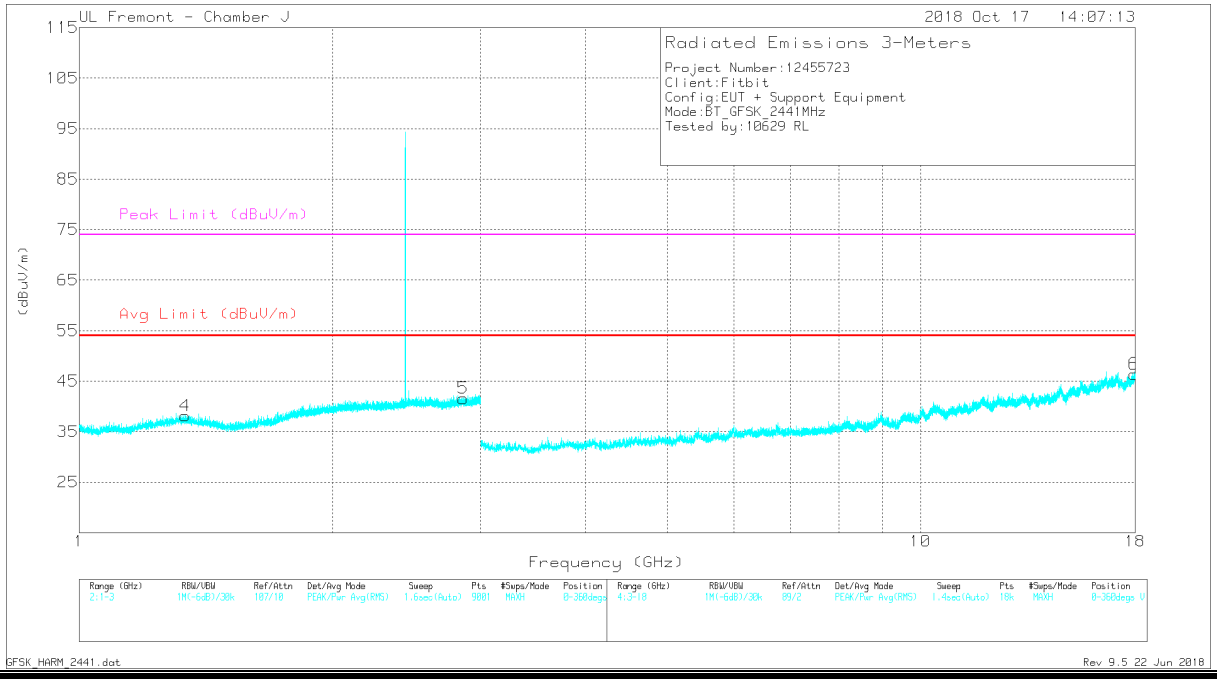
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.378	46.76	PKFH	32	-25.8	52.96	-	-	74	-21.04	234	148	H
	* 2.378	40.88	VA1T	32	-25.8	47.08	54	-6.92	-	-	234	148	H
2	* 2.839	42.34	PKFH	32.5	-25.5	49.34	-	-	74	-24.66	173	239	H
	* 2.839	29.51	VA1T	32.5	-25.5	36.51	54	-17.49	-	-	173	239	H
4	* 2.378	45.78	PKFH	32	-25.8	51.98	-	-	74	-22.02	141	108	V
	* 2.378	38.33	VA1T	32	-25.8	44.53	54	-9.47	-	-	141	108	V
5	* 2.878	41.89	PKFH	32.5	-25.4	48.99	-	-	74	-25.01	76	240	V
	* 2.88	29.48	VA1T	32.5	-25.4	36.58	54	-17.42	-	-	76	240	V
3	* 17.992	30.92	PKFH	40.8	-17.8	53.92	-	-	74	-20.08	151	270	H
	* 17.995	18.2	VA1T	40.8	-17.8	41.2	54	-12.8	-	-	151	270	H
6	* 17.915	31.87	PKFH	40.6	-18.5	53.97	-	-	74	-20.03	58	171	V
	* 17.914	18.28	VA1T	40.6	-18.5	40.38	54	-13.62	-	-	58	171	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

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL

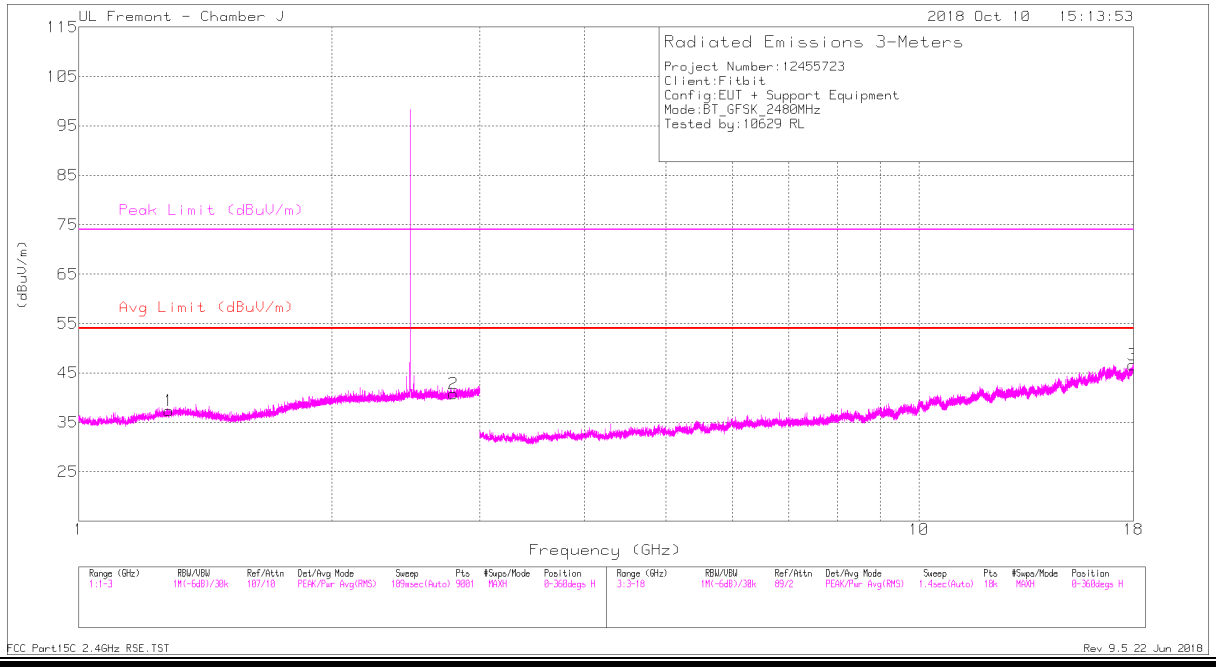


DATA

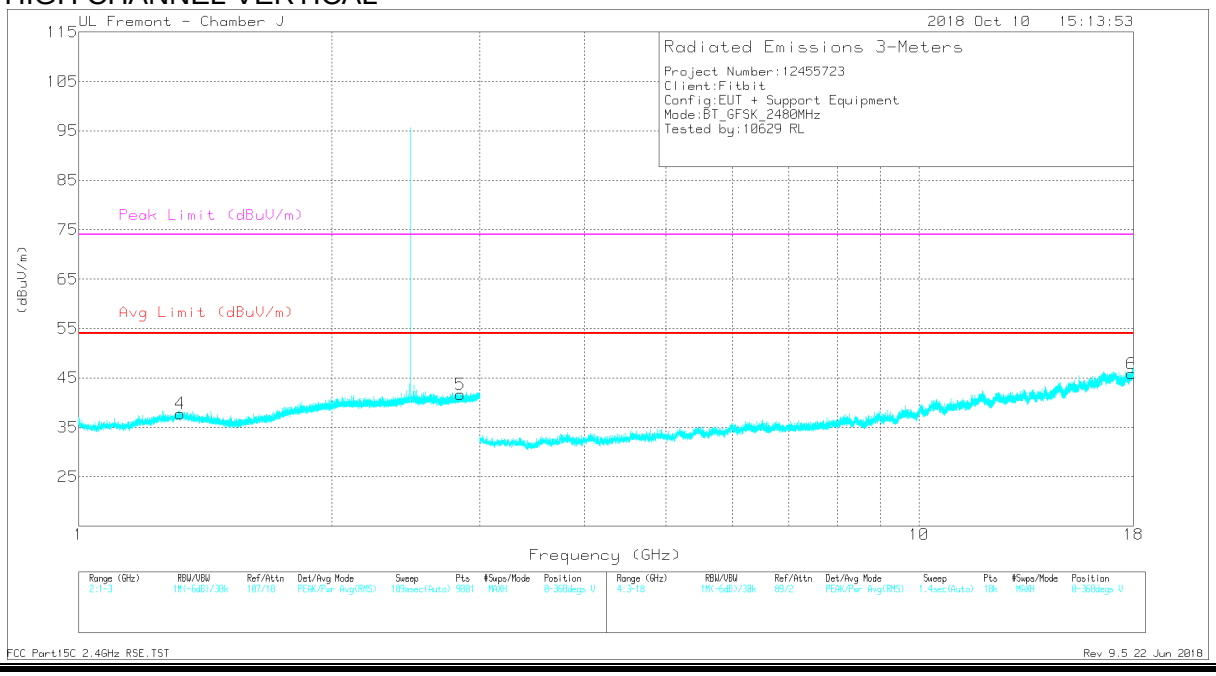
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.316	43.74	PKFH	29.3	-26	47.04	-	-	74	-26.96	106	310	H
	* 1.313	29.72	VA1T	29.3	-26	33.02	54	-20.98	-	-	106	310	H
2	* 2.807	44.29	PKFH	32.5	-25.5	51.29	-	-	74	-22.71	211	340	H
	* 2.809	29.53	VA1T	32.5	-25.5	36.53	54	-17.47	-	-	211	340	H
4	* 1.337	42.85	PKFH	29.3	-26	46.15	-	-	74	-27.85	137	291	V
	* 1.338	29.85	VA1T	29.3	-26	33.15	54	-20.85	-	-	137	291	V
5	* 2.859	41.86	PKFH	32.5	-25.4	48.96	-	-	74	-25.04	31	115	V
	* 2.859	29.68	VA1T	32.5	-25.4	36.78	54	-17.22	-	-	31	115	V
3	* 17.868	31.44	PKFH	40.7	-18.3	53.84	-	-	74	-20.16	220	182	H
	* 17.871	18.26	VA1T	40.6	-18.3	40.56	54	-13.44	-	-	220	182	H
6	* 17.929	30.73	PKFH	40.6	-18.4	52.93	-	-	74	-21.07	358	144	V
	* 17.93	18.18	VA1T	40.6	-18.4	40.38	54	-13.62	-	-	358	144	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

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



DATA

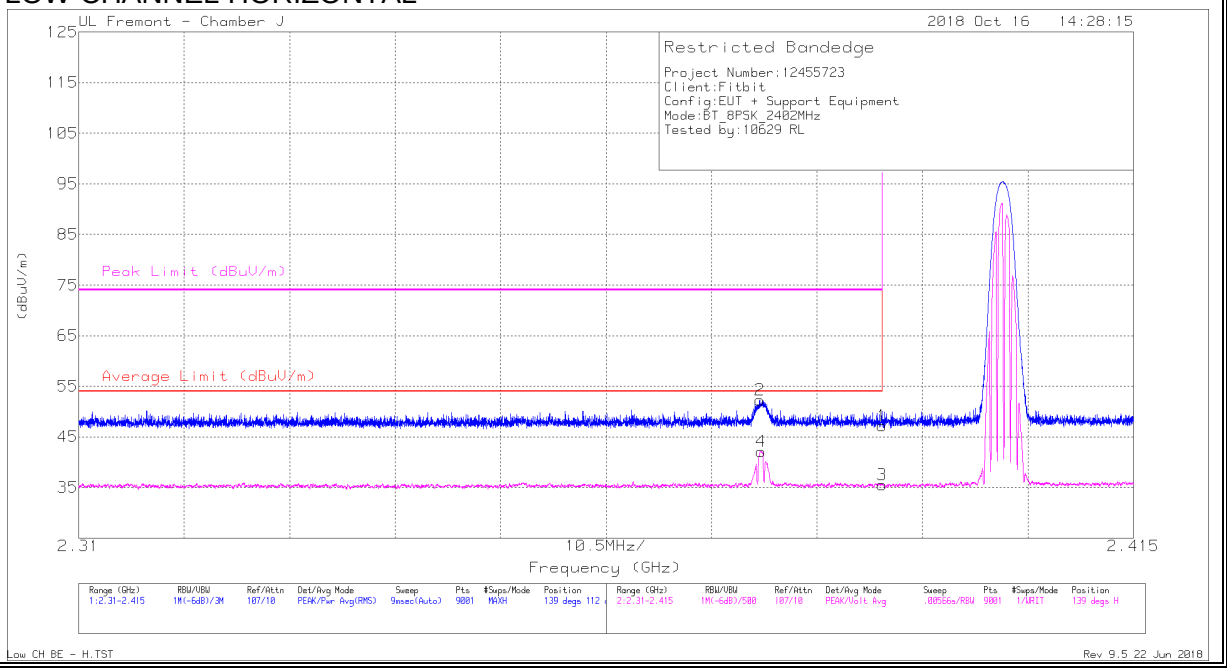
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.28	43.21	PKFH	29.1	-26.1	46.21	-	-	74	-27.79	351	319	H
	* 1.279	29.8	VA1T	29.1	-26.1	32.8	54	-21.2	-	-	351	319	H
2	* 2.79	42.07	PKFH	32.4	-25.5	48.97	-	-	74	-25.03	242	269	H
	* 2.791	29.45	VA1T	32.4	-25.5	36.35	54	-17.65	-	-	242	269	H
4	* 1.321	41.86	PKFH	29.3	-26.1	45.06	-	-	74	-28.94	295	136	V
	* 1.321	29.69	VA1T	29.3	-26.1	32.89	54	-21.11	-	-	295	136	V
5	* 2.845	41.93	PKFH	32.5	-25.4	49.03	-	-	74	-24.97	114	185	V
	* 2.848	29.62	VA1T	32.5	-25.4	36.72	54	-17.28	-	-	114	185	V
3	* 17.97	31.56	PKFH	40.7	-18	54.26	-	-	74	-19.74	86	220	H
	* 17.967	18.3	VA1T	40.7	-18.1	40.9	54	-13.1	-	-	86	220	H
6	* 17.905	30.53	PKFH	40.5	-18.4	52.63	-	-	74	-21.37	132	133	V
	* 17.905	18.43	VA1T	40.5	-18.4	40.53	54	-13.47	-	-	132	133	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

9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

RESTRICTED BANDEDGE (LOW CHANNEL)

LOW CHANNEL HORIZONTAL

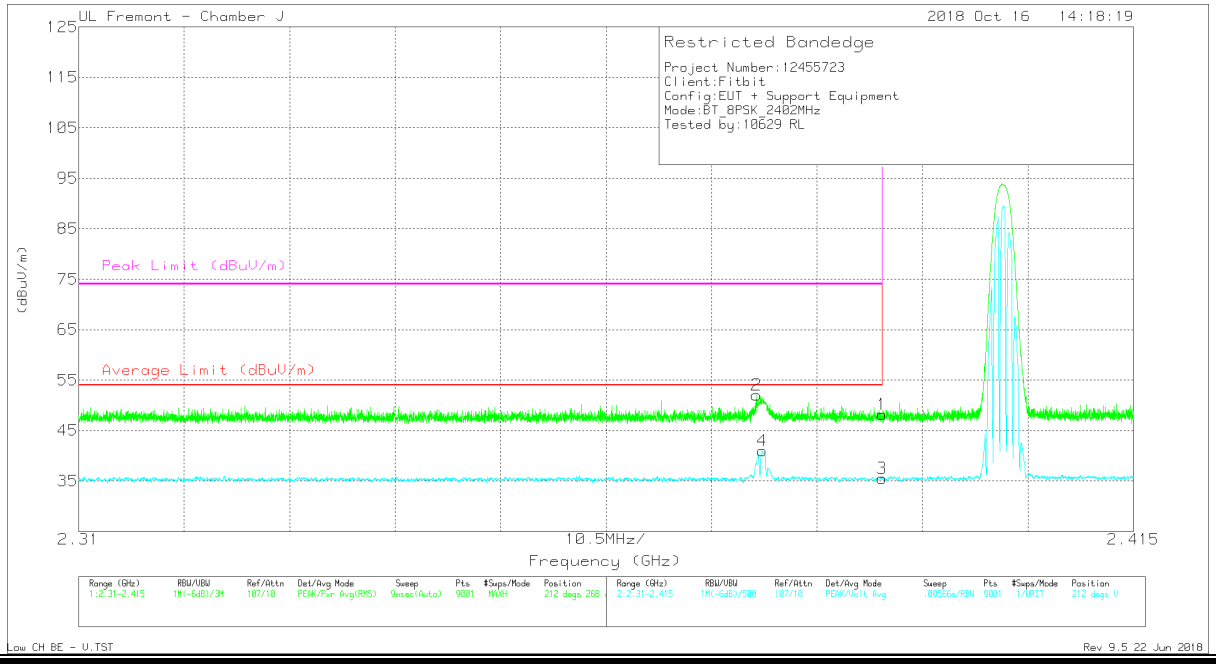


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (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	41.02	Pk	32	-25.8	47.22	-	-	74	-26.78	139	112	H
2	* 2.378	46.04	Pk	32	-25.8	52.24	-	-	74	-21.76	139	112	H
3	* 2.39	29.32	VA1T	32	-25.8	35.52	54	-18.48	-	-	139	112	H
4	* 2.378	35.95	VA1T	32	-25.8	42.15	54	-11.85	-	-	139	112	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

LOW CHANNEL VERTICAL



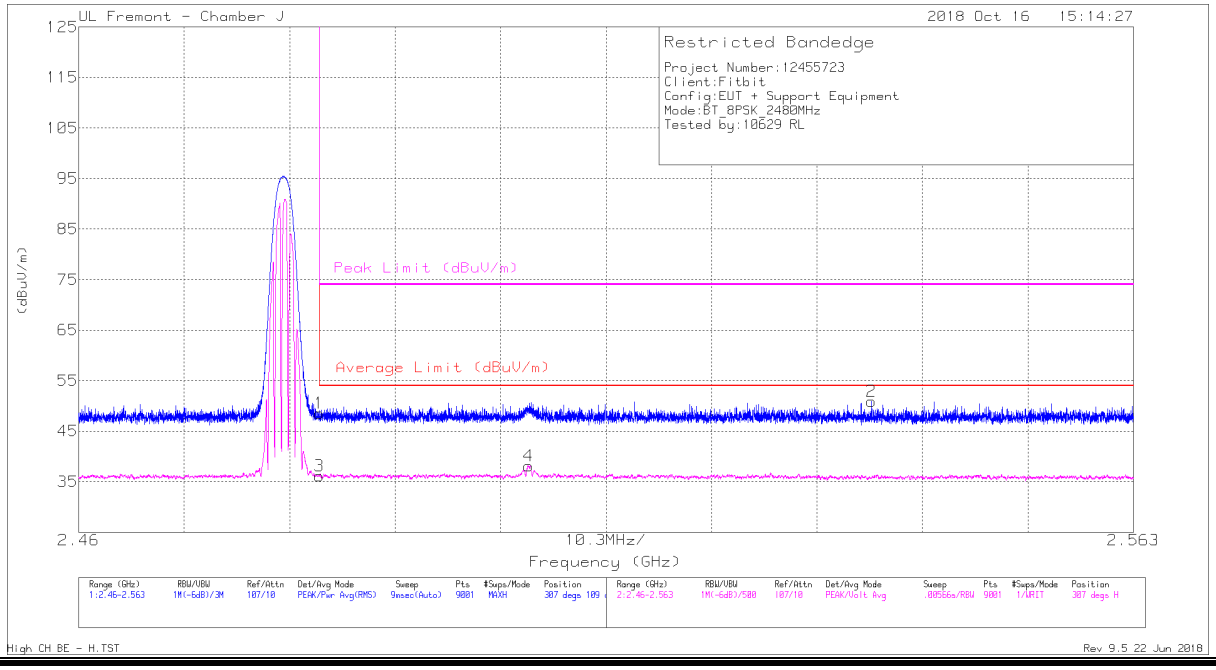
DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (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	41.98	Pk	32	-25.8	48.18	-	-	74	-25.82	212	268	V
2	* 2.377	45.8	Pk	32	-25.8	52	-	-	74	-22	212	268	V
3	* 2.39	29.34	VA1T	32	-25.8	35.54	54	-18.46	-	-	212	268	V
4	* 2.378	34.81	VA1T	32	-25.8	41.01	54	-12.99	-	-	212	268	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

AUTHORIZED BANDEDGE (HIGH CHANNEL)

HIGH CHANNEL HORIZONTAL

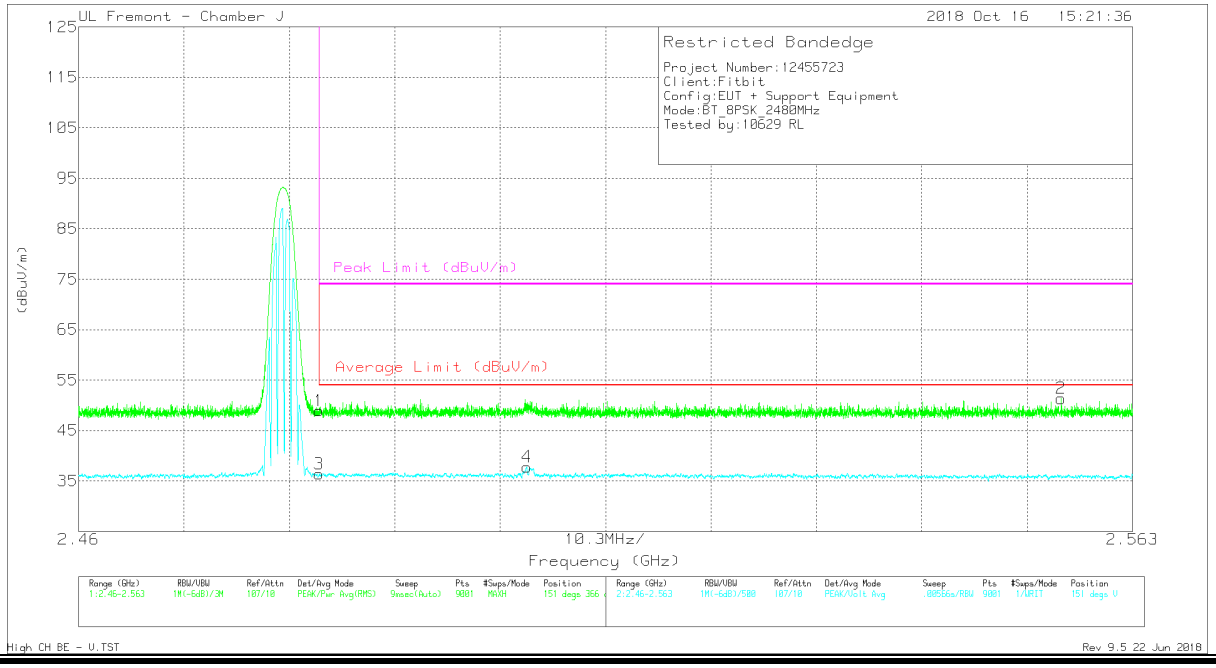


DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (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	41.84	Pk	32.5	-25.8	48.54	-	-	74	-25.46	307	109	H
2	2.537	44.09	Pk	32.5	-25.7	50.89	-	-	74	-23.11	307	109	H
3	* 2.484	29.45	VA1T	32.5	-25.8	36.15	54	-17.85	-	-	307	109	H
4	2.504	31.44	VA1T	32.5	-25.8	38.14	54	-15.86	-	-	307	109	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

HIGH CHANNEL VERTICAL



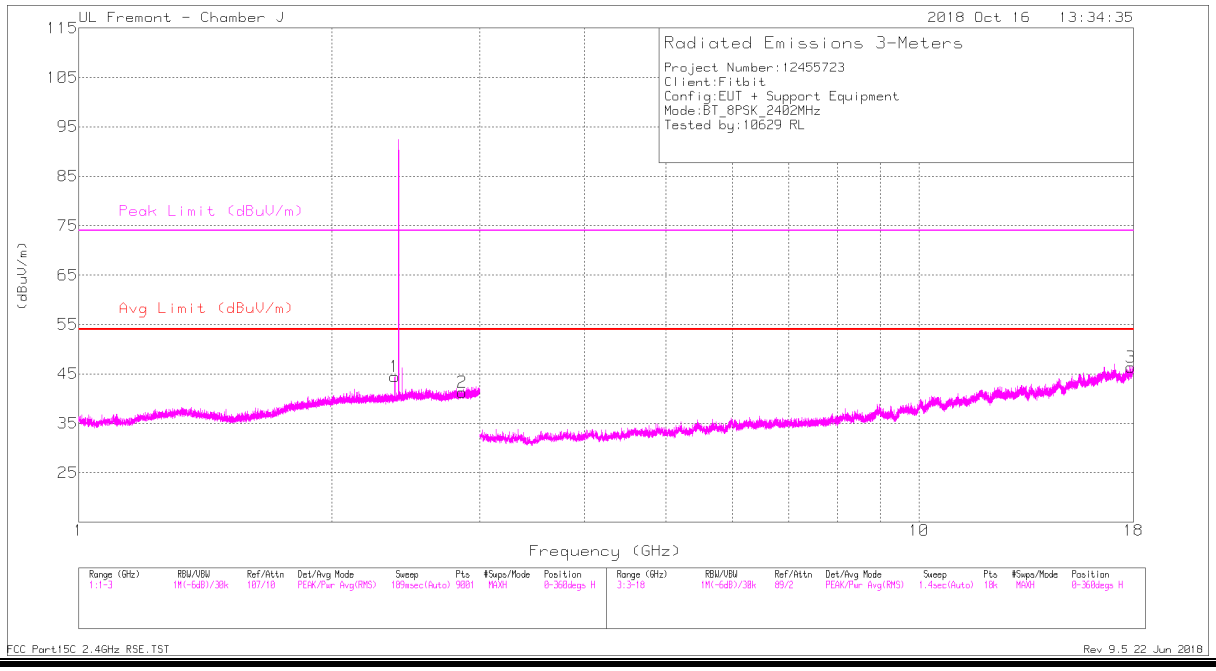
DATA

\Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (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	42.19	Pk	32.5	-25.8	48.89	-	-	74	-25.11	151	366	V
2	2.556	44.45	Pk	32.5	-25.6	51.35	-	-	74	-22.65	151	366	V
3	* 2.484	29.67	VA1T	32.5	-25.8	36.37	54	-17.63	-	-	151	366	V
4	2.504	31.11	VA1T	32.5	-25.8	37.81	54	-16.19	-	-	151	366	V

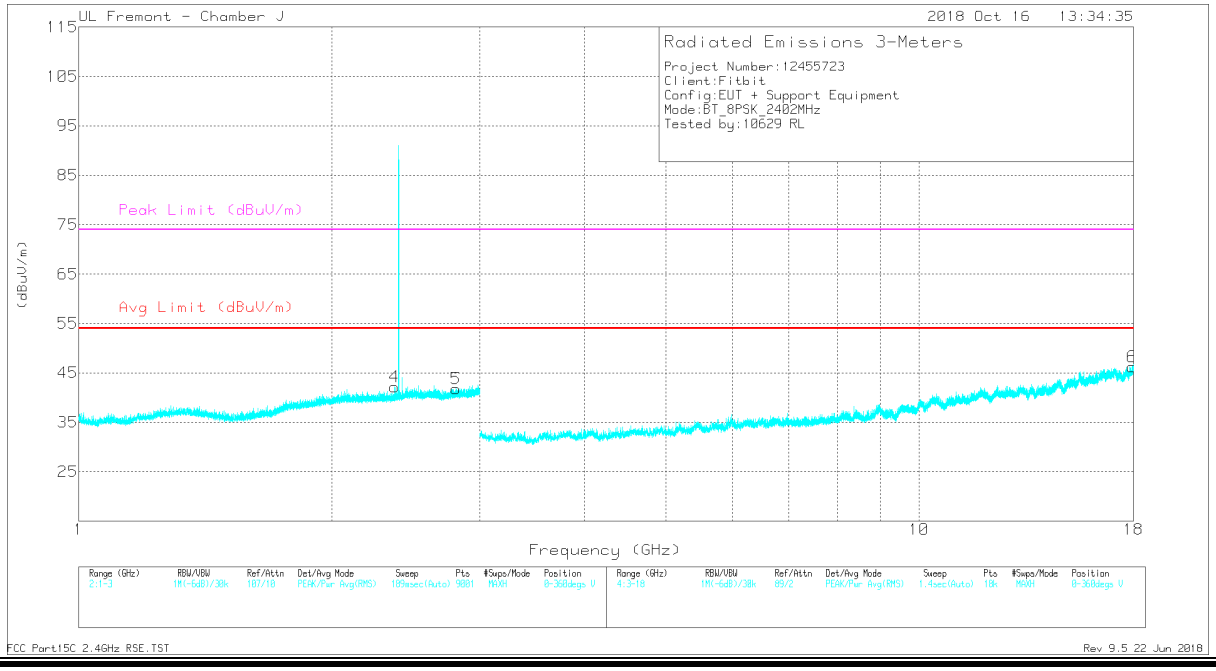
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL HORIZONTAL



LOW CHANNEL VERTICAL

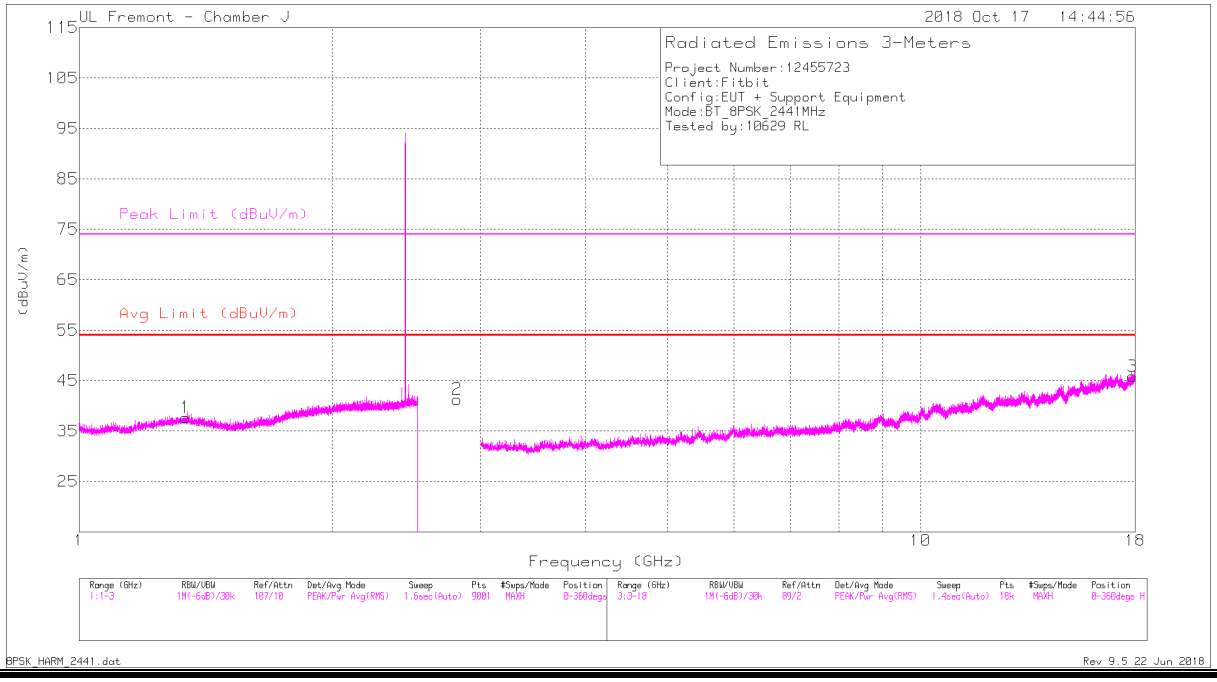


DATA

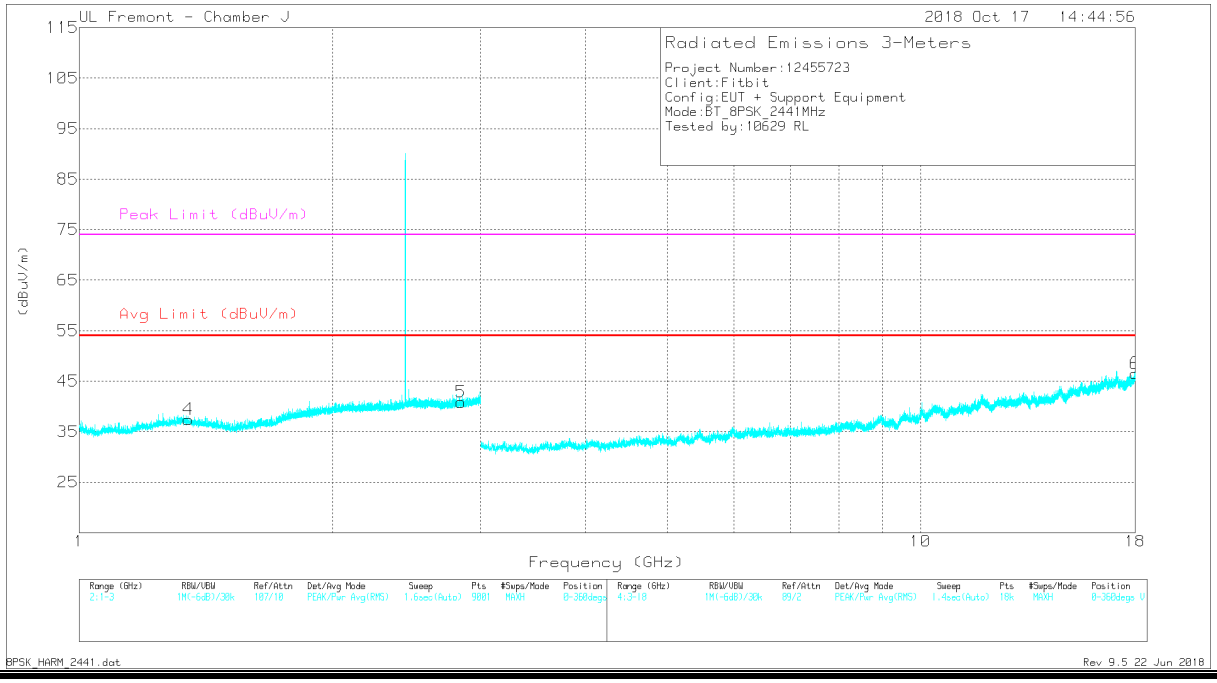
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.378	45.16	PKFH	32	-25.8	51.36	-	-	74	-22.64	142	153	H
	* 2.378	36.02	VA1T	32	-25.8	42.22	54	-11.78	-	-	142	153	H
2	* 2.86	42.06	PKFH	32.5	-25.4	49.16	-	-	74	-24.84	311	188	H
	* 2.858	29.44	VA1T	32.5	-25.4	36.54	54	-17.46	-	-	311	188	H
4	* 2.378	43.48	PKFH	32	-25.8	49.68	-	-	74	-24.32	152	109	V
	* 2.378	33.94	VA1T	32	-25.8	40.14	54	-13.86	-	-	152	109	V
5	* 2.81	42.12	PKFH	32.5	-25.5	49.12	-	-	74	-24.88	235	130	V
	* 2.81	29.42	VA1T	32.5	-25.5	36.42	54	-17.58	-	-	235	130	V
3	* 17.868	31.25	PKFH	40.6	-18.3	53.55	-	-	74	-20.45	314	219	H
	* 17.867	18.22	VA1T	40.7	-18.3	40.62	54	-13.38	-	-	314	219	H
6	* 17.947	31.05	PKFH	40.7	-18.4	53.35	-	-	74	-20.65	203	309	V
	* 17.945	18.25	VA1T	40.7	-18.4	40.55	54	-13.45	-	-	203	309	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

MID CHANNEL HORIZONTAL



MID CHANNEL VERTICAL

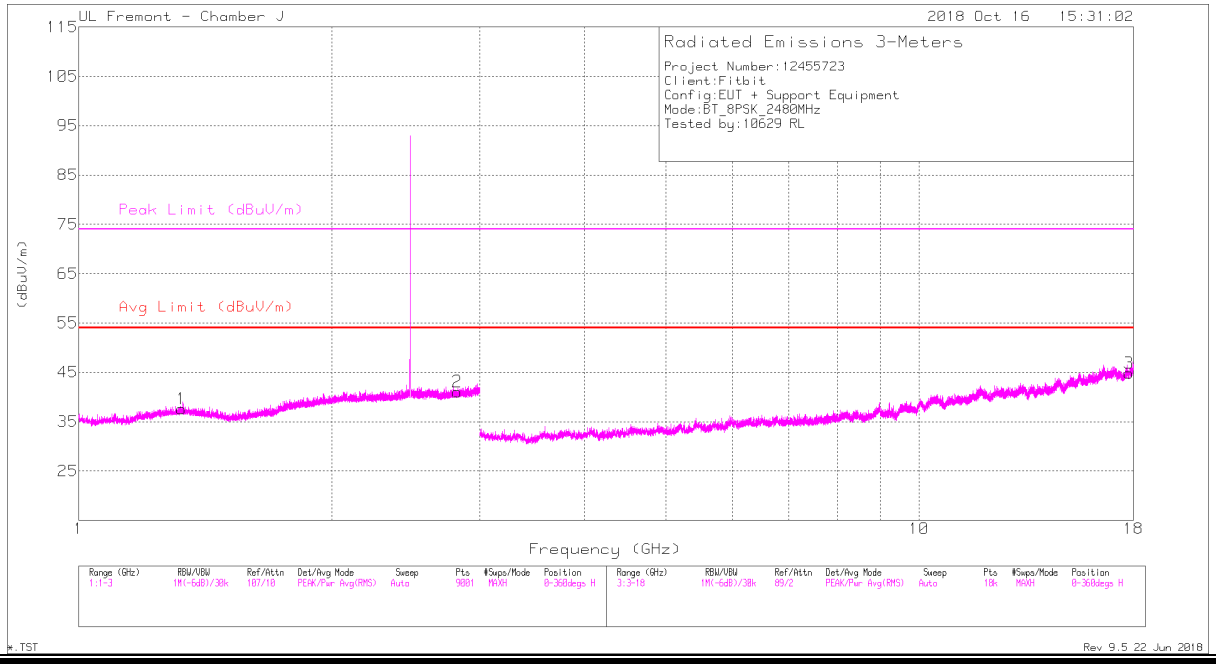


DATA

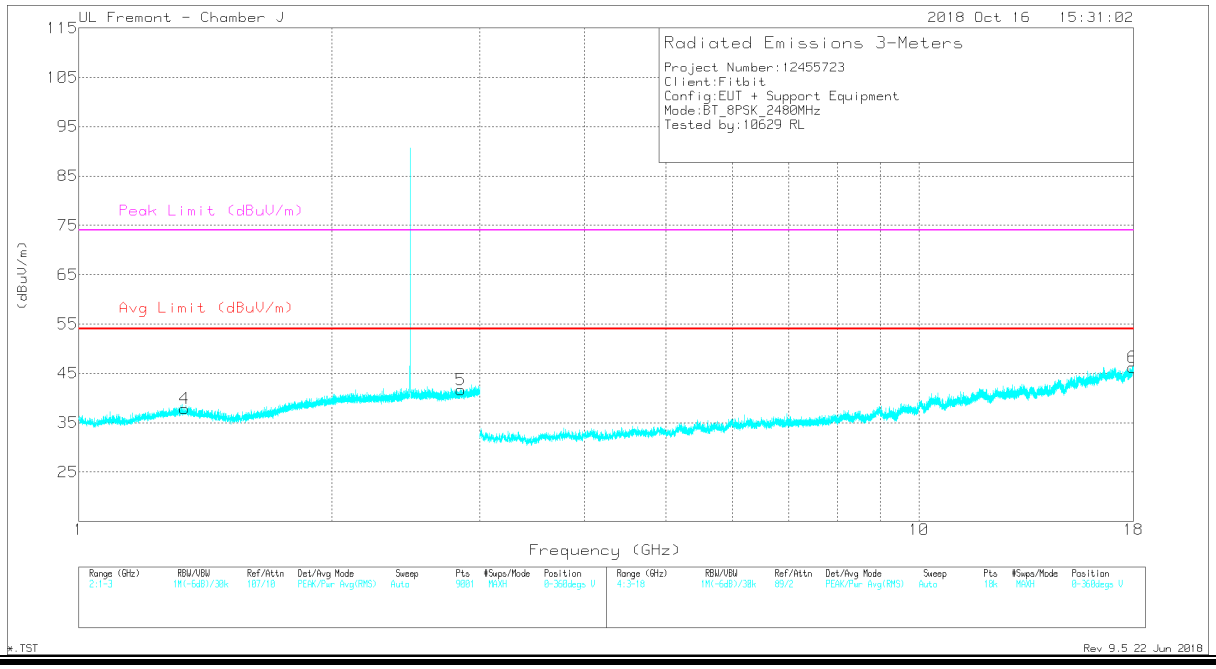
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.337	42.69	PKFH	29.3	-26	45.99	-	-	74	-28.01	272	101	H
	* 1.339	29.74	VA1T	29.3	-26.1	32.94	54	-21.06	-	-	272	101	H
2	* 2.813	41.24	PKFH	32.5	-25.5	48.24	-	-	74	-25.76	181	196	H
	* 2.811	29.26	VA1T	32.5	-25.5	36.26	54	-17.74	-	-	181	196	H
4	* 1.348	42.26	PKFH	29.3	-26.1	45.46	-	-	74	-28.54	327	286	V
	* 1.348	29.67	VA1T	29.3	-26.1	32.87	54	-21.13	-	-	327	286	V
5	* 2.84	41.52	PKFH	32.5	-25.5	48.52	-	-	74	-25.48	121	249	V
	* 2.842	29.42	VA1T	32.5	-25.4	36.52	54	-17.48	-	-	121	249	V
3	* 17.872	30.65	PKFH	40.6	-18.3	52.95	-	-	74	-21.05	68	329	H
	* 17.871	18.22	VA1T	40.6	-18.3	40.52	54	-13.48	-	-	68	329	H
6	* 17.998	30.33	PKFH	40.8	-17.8	53.33	-	-	74	-20.67	145	363	V
	* 17.997	18.36	VA1T	40.8	-17.8	41.36	54	-12.64	-	-	145	363	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

HIGH CHANNEL HORIZONTAL



HIGH CHANNEL VERTICAL



DATA

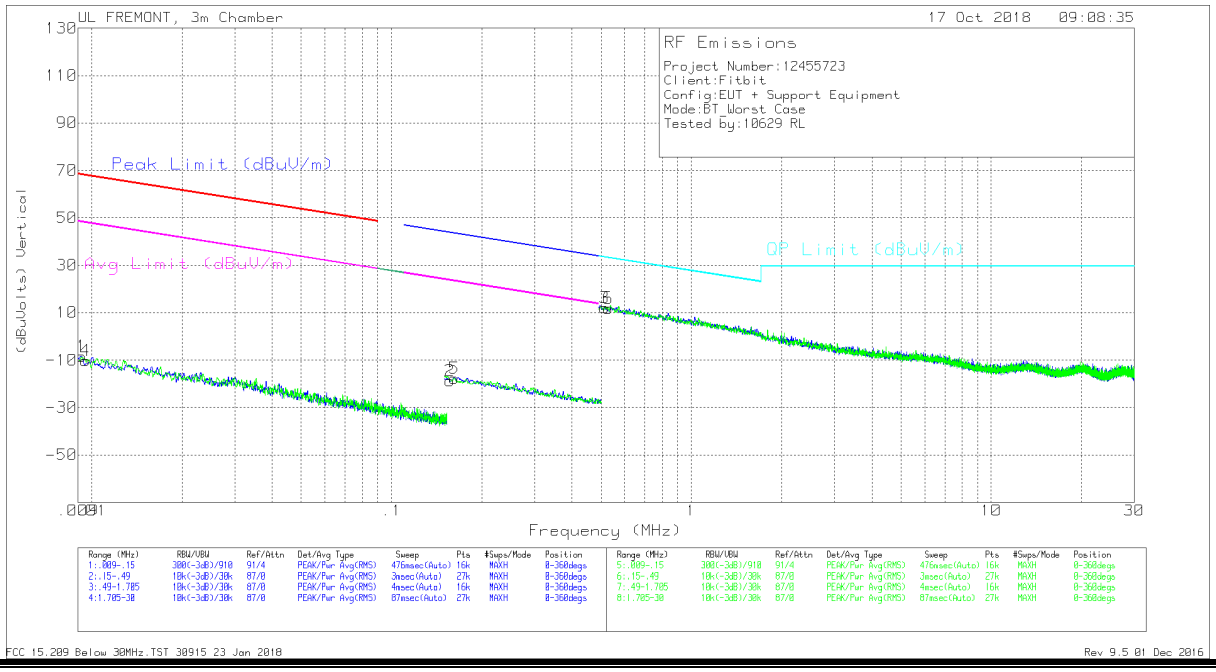
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF AT0067 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.324	42.88	PKFH	29.3	-26	46.18	-	-	74	-27.82	261	139	H
	* 1.325	29.78	VA1T	29.3	-26	33.08	54	-20.92	-	-	261	139	H
2	* 2.821	42.2	PKFH	32.5	-25.5	49.2	-	-	74	-24.8	35	126	H
	* 2.824	29.49	VA1T	32.5	-25.4	36.59	54	-17.41	-	-	35	126	H
4	* 1.339	41.93	PKFH	29.3	-26.1	45.13	-	-	74	-28.87	121	149	V
	* 1.339	29.61	VA1T	29.3	-26.1	32.81	54	-21.19	-	-	121	149	V
5	* 2.853	42.13	PKFH	32.5	-25.4	49.23	-	-	74	-24.77	276	341	V
	* 2.852	29.57	VA1T	32.5	-25.4	36.67	54	-17.33	-	-	276	341	V
3	* 17.78	32.39	PKFH	40.7	-18.3	54.79	-	-	74	-19.21	199	282	H
	* 17.782	18.15	VA1T	40.7	-18.3	40.55	54	-13.45	-	-	199	282	H
6	* 17.971	31.8	PKFH	40.7	-18	54.5	-	-	74	-19.5	82	250	V
	* 17.97	18.37	VA1T	40.7	-18	41.07	54	-12.93	-	-	82	250	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

9.3. WORST-CASE BELOW 30MHz

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)

ANTENNA LOOP FACE ON AND FACE OFF



DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.00926	54.64	Pk	15.6	1.4	-80	-8.36	68.25	-76.61	48.25	-56.61	-	-	0-360
4	.00953	52.94	Pk	15.4	1.4	-80	-10.26	68	-78.26	48	-58.26	-	-	0-360
2	.1565	45.88	Pk	13.8	1.5	-80	-18.82	43.73	-62.55	23.73	-42.55	-	-	0-360
5	.16193	47.05	Pk	13.8	1.5	-80	-17.65	43.44	-61.09	23.44	-41.09	-	-	0-360

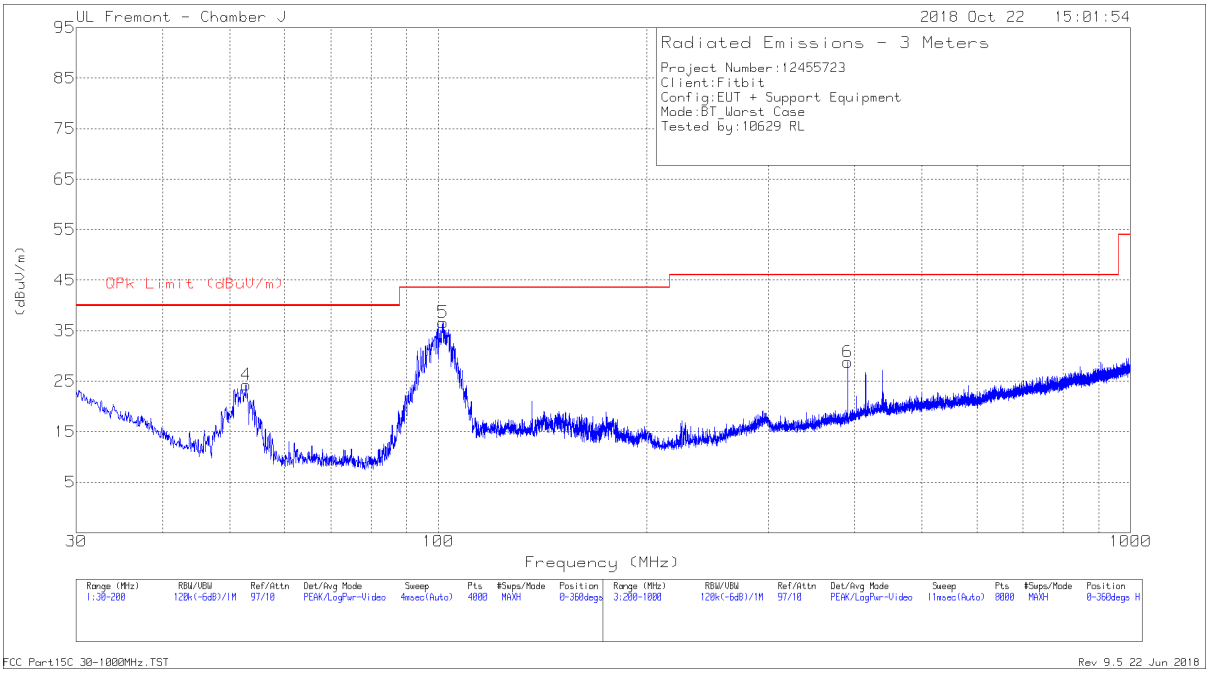
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.51269	36.76	Pk	13.9	1.5	-40	12.16	33.41	-21.25	0-360
6	.52777	36.53	Pk	13.9	1.5	-40	11.93	33.16	-21.23	0-360

Pk - Peak detector

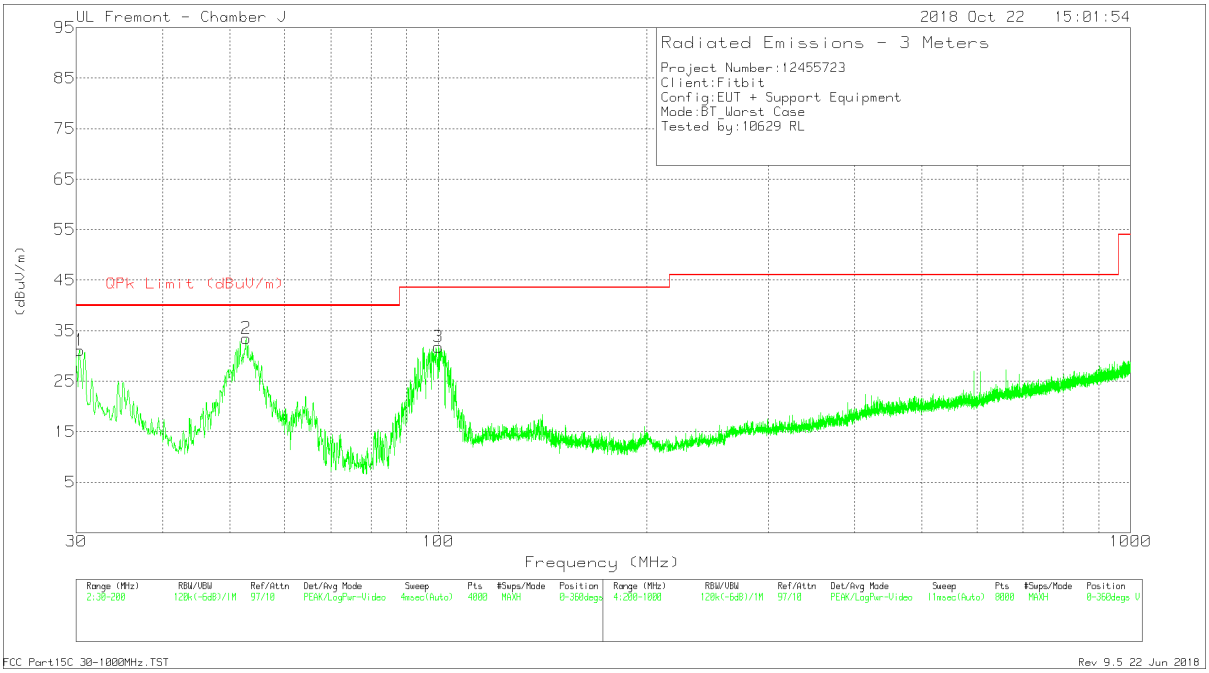
9.4. WORST-CASE 30MHz TO 1GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



DATA

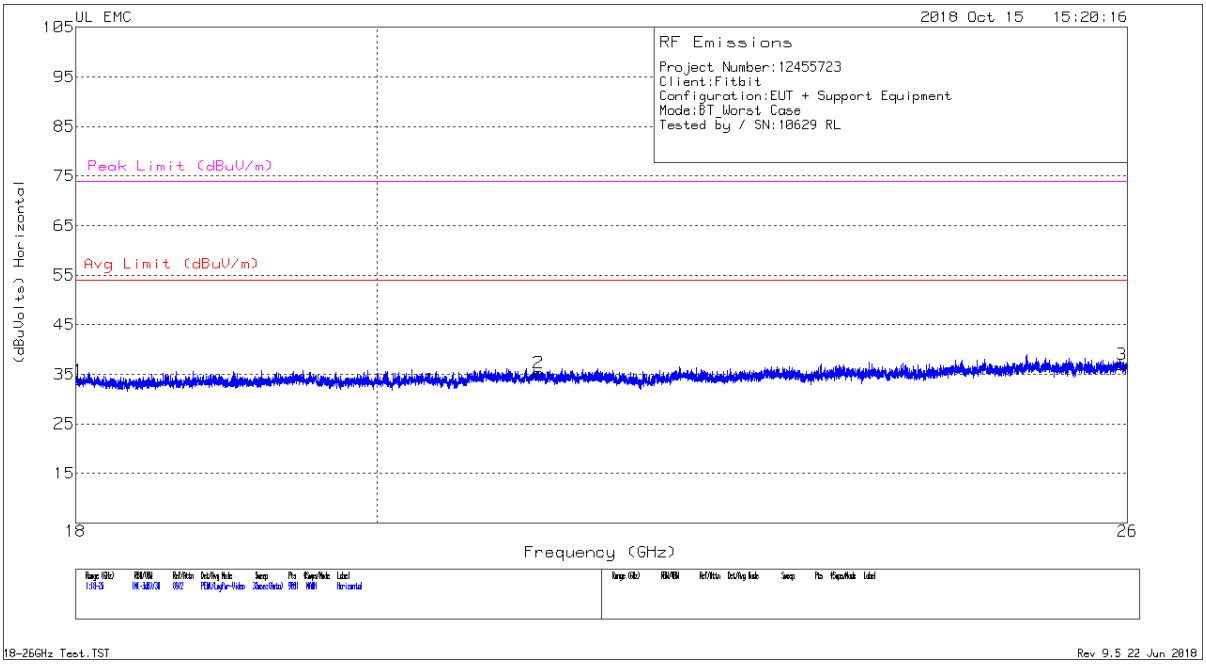
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0181575 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	51.9995	46.18	Pk	13.3	-31.3	28.18	40	-11.82	205	378	H
	51.9995	38.25	Qp	13.3	-31.3	20.25	40	-19.75	205	378	H
5	101.0498	45.15	Qp	16.6	-30.9	30.85	43.52	-12.67	332	306	H
	100.9461	50.92	Pk	16.6	-30.9	36.62	43.52	-6.9	323	305	H
1	30.0511	40.37	Pk	26.7	-31.6	35.47	40	-4.53	98	105	V
	30.0511	29.66	Qp	26.7	-31.6	24.76	40	-15.24	98	105	V
2	52.4372	53.85	Pk	13.3	-31.3	35.85	40	-4.15	268	112	V
	52.4372	46.4	Qp	13.3	-31.3	28.4	40	-11.6	268	112	V
3	94.6964	48.33	Pk	14.8	-30.9	32.23	43.52	-11.29	4	133	V
	94.6964	38.81	Qp	14.8	-30.9	22.71	43.52	-20.81	4	133	V
6	390.4792	30.33	Pk	21.1	-29.8	21.63	46.02	-24.39	73	164	H
	390.4792	21.9	Qp	21.1	-29.8	13.2	46.02	-32.82	73	164	H

Pk - Peak detector
Qp - Quasi-Peak detector

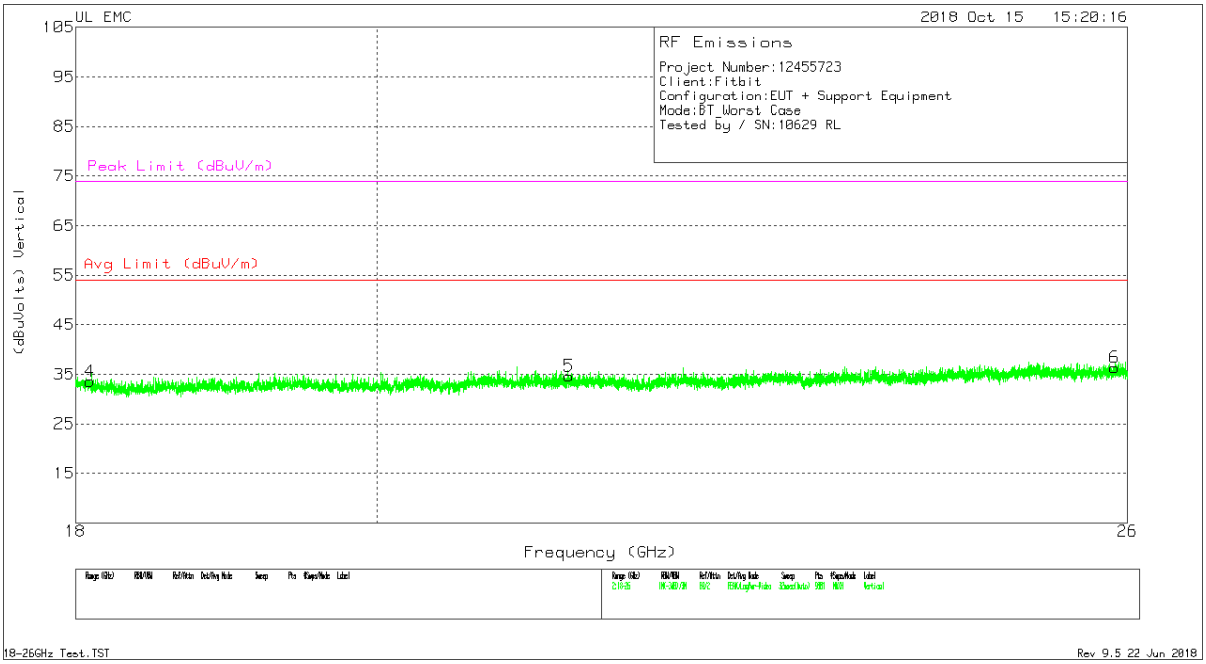
9.5. WORST-CASE ABOVE 18GHz

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

HORIZONTAL PLOT



VERTICAL PLOT



DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T448 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	18.022	71.03	Pk	32.4	-60.1	-9.5	33.83	54	-20.17	74	-40.17
2	21.162	68.46	Pk	33.2	-56.8	-9.5	35.36	54	-18.64	74	-38.64
3	25.947	67.14	Pk	34.7	-55.4	-9.5	36.94	54	-17.06	74	-37.06
4	18.092	70.7	Pk	32.3	-59.9	-9.5	33.6	54	-20.4	74	-40.4
5	21.386	68.42	Pk	33.1	-57.4	-9.5	34.62	54	-19.38	74	-39.38
6	25.881	66.24	Pk	34.8	-55.2	-9.5	36.34	54	-17.66	74	-37.66

Pk - Peak detector

10. 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.

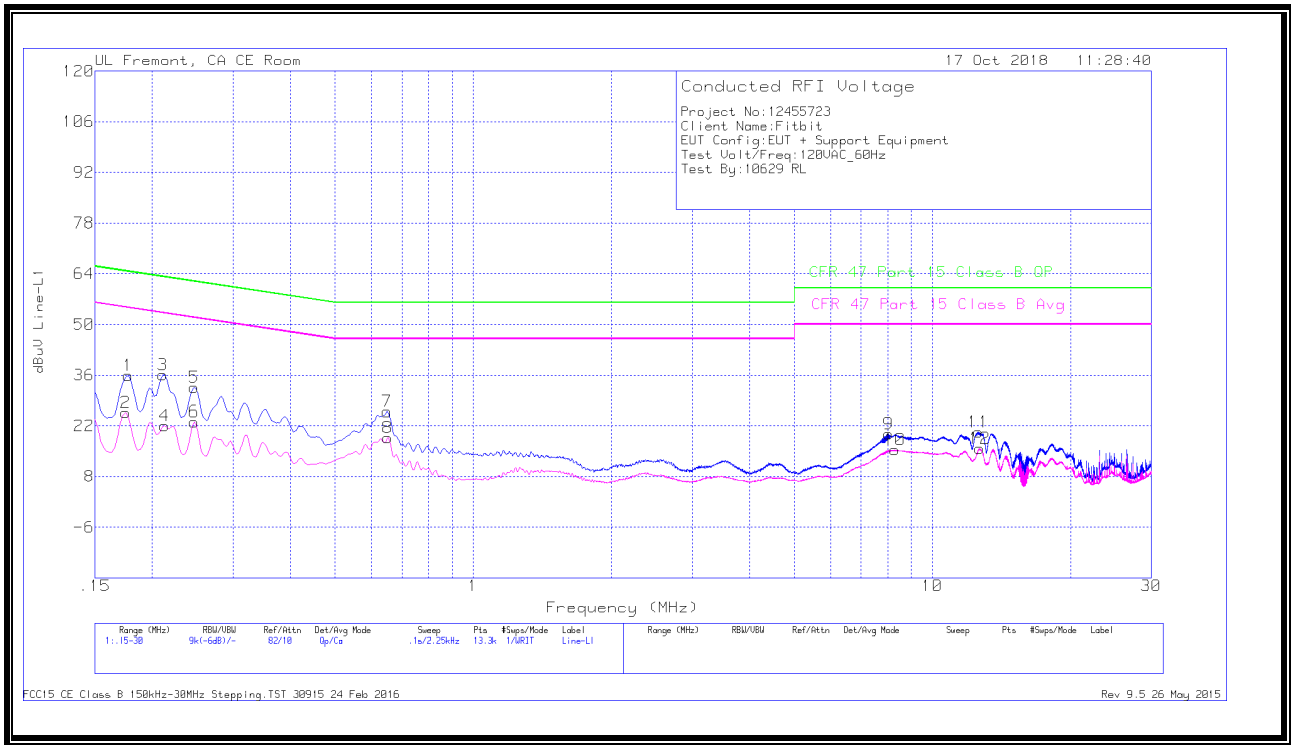
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both Line 1 (HOT) and Line 2 (NEUTRAL).

RESULTS

Note: EUT powered by AC/DC adapter via USB cable.

LINE 1 RESULTS

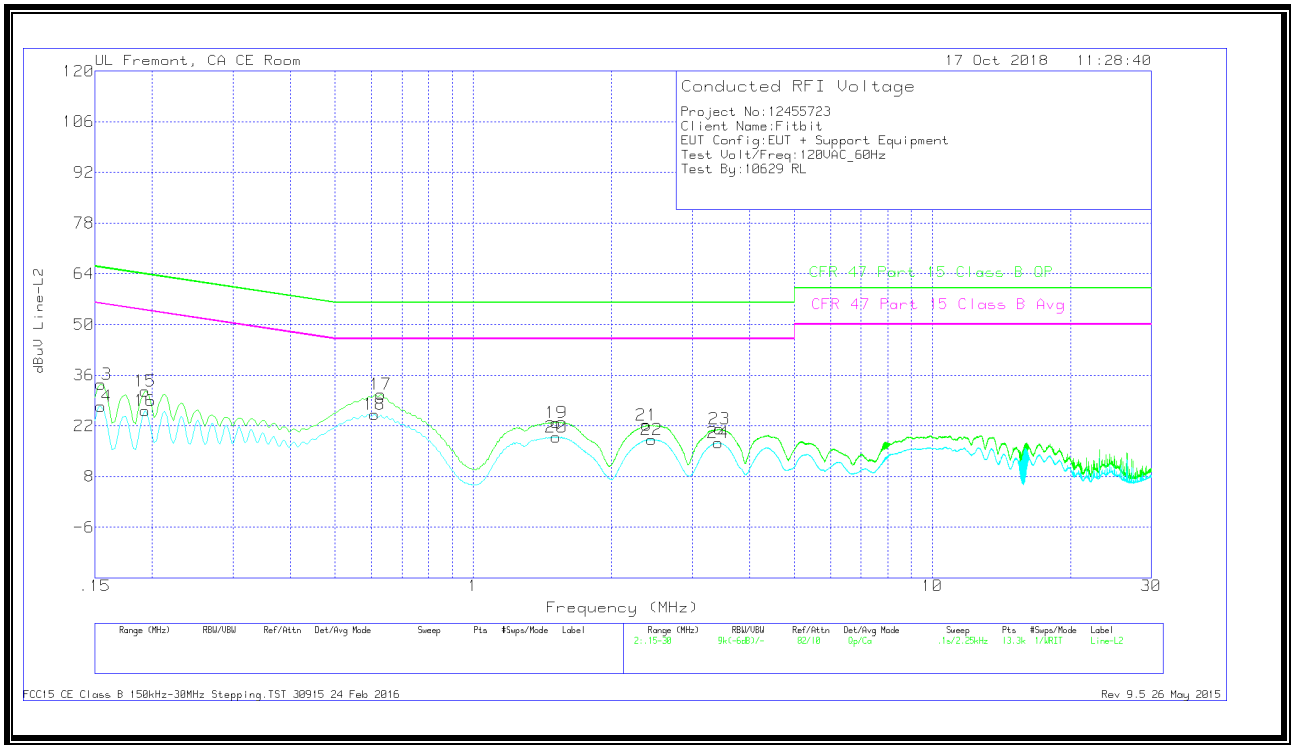


WORST EMISSIONS

Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	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	.177	25.86	Qp	0	0	10.1	35.96	64.63	-28.67	-	-
2	.17475	15.5	Ca	0	0	10.1	25.6	-	-	54.73	-29.13
3	.21075	26.05	Qp	0	0	10.1	36.15	63.18	-27.03	-	-
4	.213	11.94	Ca	0	0	10.1	22.04	-	-	53.09	-31.05
5	.24675	22.58	Qp	0	0	10.1	32.68	61.87	-29.19	-	-
6	.24675	13.04	Ca	0	0	10.1	23.14	-	-	51.87	-28.73
7	.6495	15.83	Qp	0	0	10.1	25.93	56	-30.07	-	-
8	.65175	8.67	Ca	0	0	10.1	18.77	-	-	46	-27.23
9	8.03175	9.33	Qp	0	.2	10.2	19.73	60	-40.27	-	-
10	8.27925	5	Ca	0	.2	10.2	15.4	-	-	50	-34.6
11	12.60825	9.78	Qp	.1	.2	10.2	20.28	60	-39.72	-	-
12	12.678	5.29	Ca	.1	.2	10.2	15.79	-	-	50	-34.21

Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS



WORST EMISSIONS

Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L2	LC Cables C2&C3	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	.1545	23.25	Qp	.1	0	10.1	33.45	65.75	-32.3	-	-
14	.1545	17.28	Ca	.1	0	10.1	27.48	-	-	55.75	-28.27
15	.19275	21.5	Qp	0	0	10.1	31.6	63.92	-32.32	-	-
16	.19275	16.05	Ca	0	0	10.1	26.15	-	-	53.92	-27.77
17	.62925	20.56	Qp	0	0	10.1	30.66	56	-25.34	-	-
18	.609	15.1	Ca	0	0	10.1	25.2	-	-	46	-20.8
19	1.518	12.76	Qp	0	.1	10.1	22.96	56	-33.04	-	-
20	1.518	8.74	Ca	0	.1	10.1	18.94	-	-	46	-27.06
21	2.3865	11.94	Qp	0	.1	10.1	22.14	56	-33.86	-	-
22	2.44388	8.06	Ca	0	.1	10.1	18.26	-	-	46	-27.74
23	3.435	10.89	Qp	0	.1	10.1	21.09	56	-34.91	-	-
24	3.41925	7.1	Ca	0	.1	10.1	17.3	-	-	46	-28.7

Qp - Quasi-Peak detector
Ca - CISPR average detection