CERTIFICATION TEST REPORT

Report Number. : 12458150-E2V6

Applicant	:	APPLE, INC. 1 APPLE PARK WAY CUPERTINO, CA 95014, U.S.A.
Model	:	A2031
FCC ID	:	BCG-A2031
IC	:	579C-A2031
EUT Description	:	BLUETOOTH EARBUD
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C ISED RSS-247 ISSUE 2

Date Of Issue:
March 18, 2019

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 319-4000
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NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	12/11/2018	Initial Issue	Joe Vang
V2	02/05/2019	Updated client's request Section 8.6 & 8.7	Tony Li
V3	02/07/2019	Updated EUT name	Chin Pang
V4	02/11/2019	Address TCB's Questions	Chin Pang
V5	02/12/2019	Address TCB's Questions	Chin Pang
V6	03/15/2019	Reduced Power per client requests	Chin Pang

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TABLE OF CONTENTS

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: BLUETOOTH EARBUD

MODEL: A2031

SERIAL NUMBER: GFHX60LFJJNV

DATE TESTED: AUGUST 15, 2018 – DECEMBER 10, 2018 AND MARCH 15, 2019

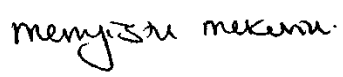
APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

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:



MENGISTU MEKURIA
CONSUMER TECHNOLOGY DIVISION
Senior Engineer
UL Verification Services Inc.

Prepared By:

FRANCISCO GUARNERO
CONSUMER TECHNOLOGY DIVISION
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, 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. 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	47658 Kato Rd
☐ Chamber A (ISED:2324B-1)	☒ Chamber D (ISED:22541-1)	☐ Chamber K (ISED:2324A-1)
☐ Chamber B (ISED:2324B-2)	☒ Chamber E (ISED:22541-2)	☐ Chamber L (ISED:2324A-3)
☐ Chamber C (ISED:2324B-3)	☐ Chamber F (ISED:22541-3)	
	☐ Chamber G (ISED:22541-4)	
	☐ Chamber H (ISED:22541-5)	

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through C are covered under ISED company address code 2324B with site numbers 2324B -1 through 2324B-3, respectively. Chambers D through H are covered under ISED company address code 22541 with site numbers 22541 -1 through 22541-5, respectively. Chambers K and L are covered under ISED company address code 2324A with site numbers 2324A-1 and 2324A-3, respectively.

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

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
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%.

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a Bluetooth earbud for the left ear. It has an integral battery, microphone and antenna. It can charge via bottom contacts with charging case. It is designed to work in conjunction with right earbud.

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	12.60	18.20
2402 - 2480	Enhanced DQPSK	13.10	20.42
2402 - 2480	Enhanced 8PSK	13.23	21.04

Note: GFSK, DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on these modes to showing compliance. For average power data please refer to section 8.7.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Frequency Range (GHz)	Ant 1 (dBi)
2.4	-6.6

5.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 1A610.

5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions 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.

Band edge and radiated emissions between 1GHz and 18GHz were performed with the EUT set to transmit at the highest power on low, middle and high channels.

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

Worst-case data rates as provided by the client were:

GFSK mode: DH5
8PSK mode: 3-DH5
Note: Reduced power from 15dBm to 12.5dBm on BDR mode and 12dBm to 10dBm on EDR mode. Conducted output power and conducted spurious were measured and tested at low limits and all other tests were tested on high power 15dBm (BDR) and 12dBm(EDR).

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
laptop	Apple	Macbook Pro	C02P41RZG086	FCC DoC
Laptop AC/DC adapter	Liteon Technology	PA-1450-BA1	B123	NA
EUT AC Adapter	Apple	A1385	D292365CDYADHLHC3	NA
Charger Case	Apple	A2031	DLCWV47HJMMT	NA

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	1	SMA	Un-Shielded	0.2	To spectrum Analyzer
2	USB	1	USB	Shielded	1	N/A
3	AC	1	AC	Un-shielded	2	N/A

I/O CABLES (RADIATED ABOVE 1 GHZ)

I/O Cable List						
Cable No	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
NA						

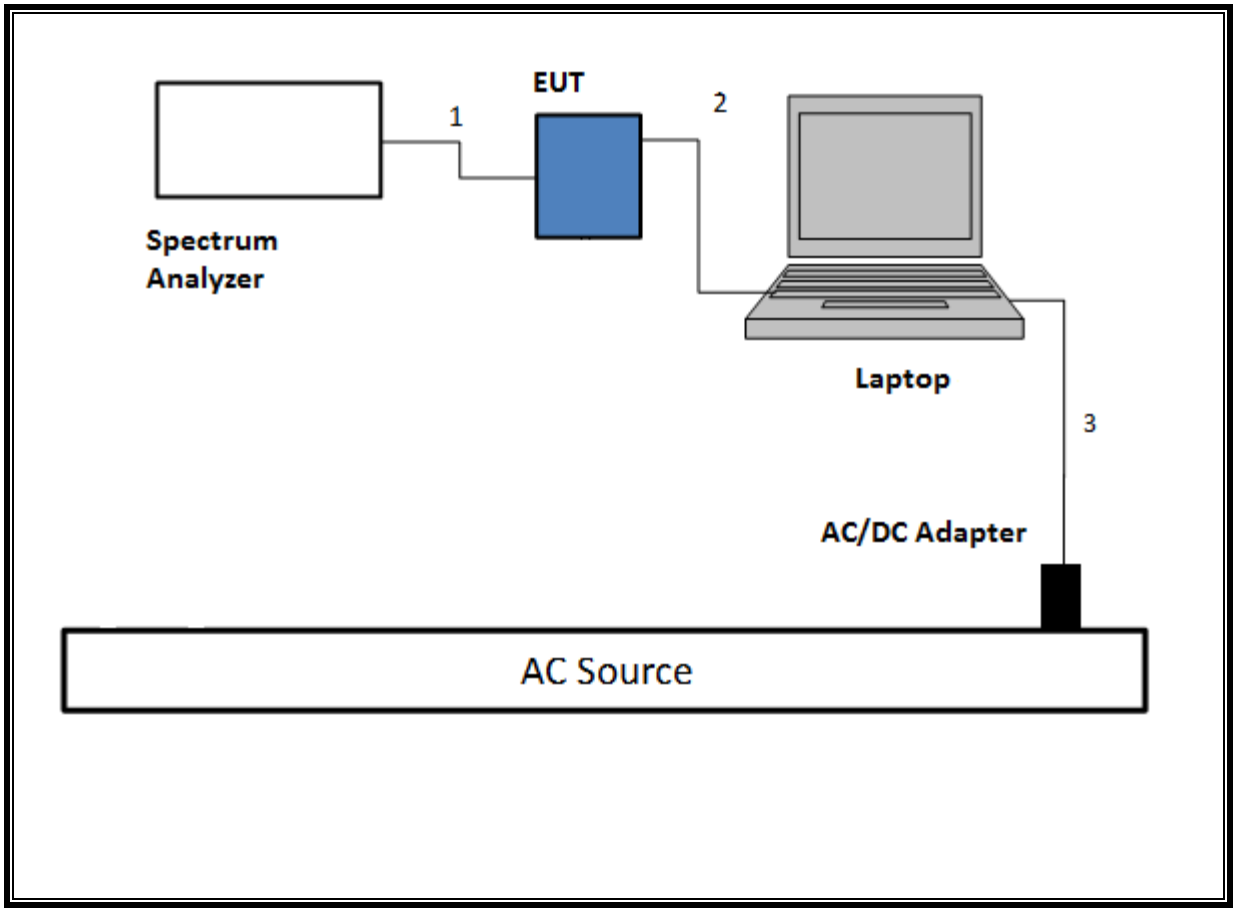
I/O CABLES (BELOW 1GHz AND AC POWER LINE TEST WITH ADAPTER AND LAPTOP)

I/O Cable List						
Cable No	**Port**	**# of identical**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	AC	1	AC	Un-shielded	2	N/A
2	USB	1	USB	Un-shielded	1	N/A

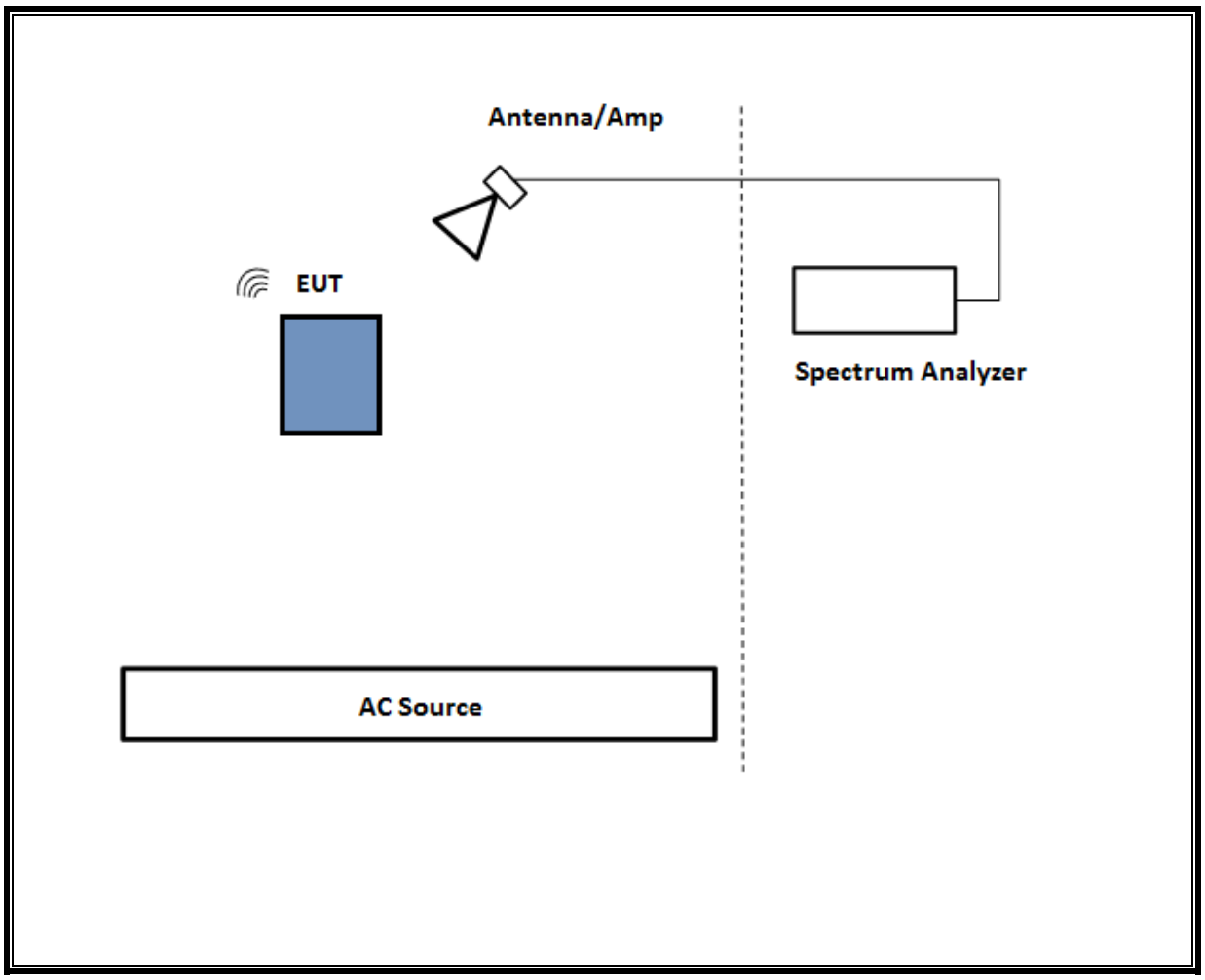
TEST SETUP

The EUT is connected to a test laptop during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR CONDUCTED TESTS



SETUP DIAGRAM FOR RADIATED TESTS ABOVE 1GHz



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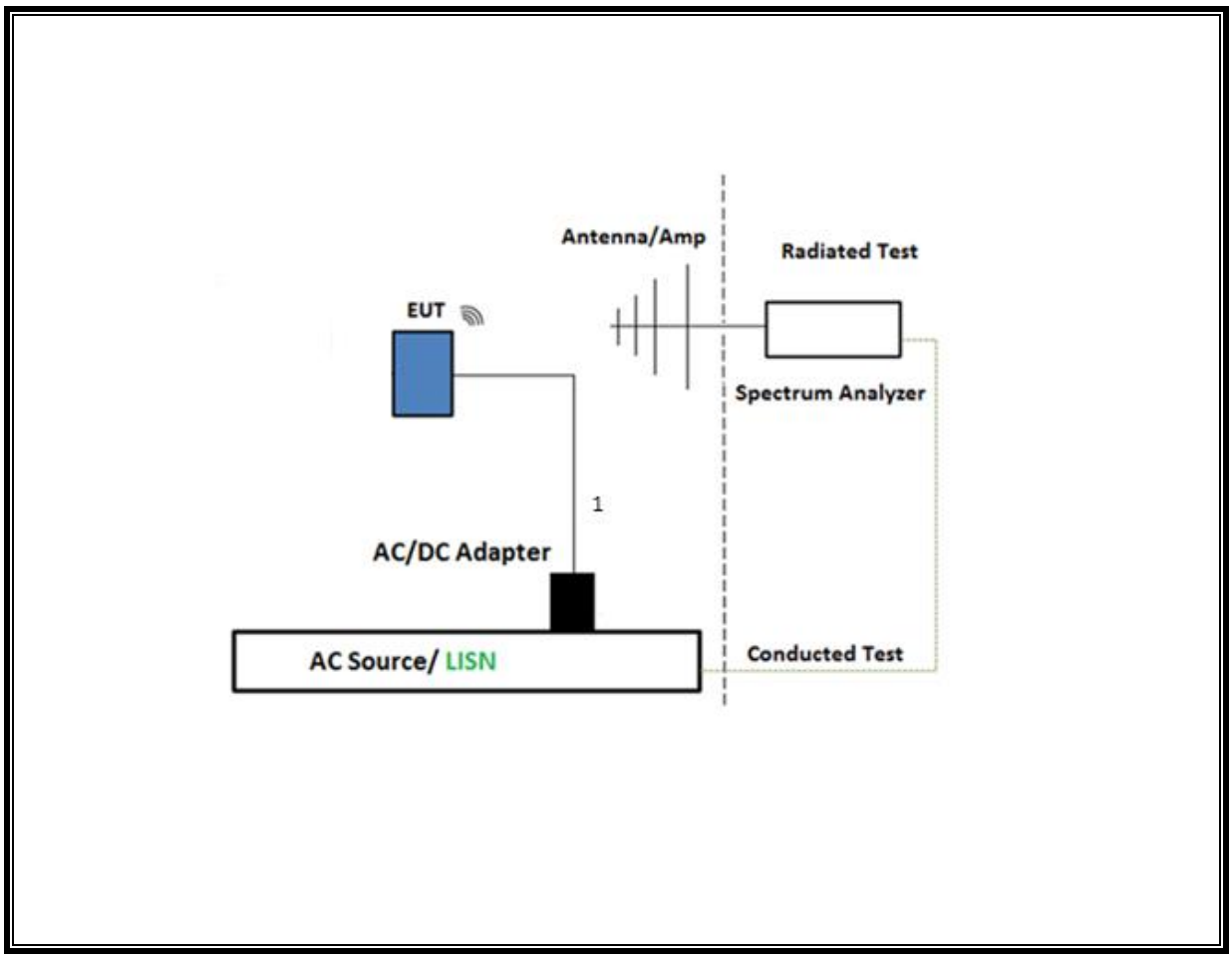
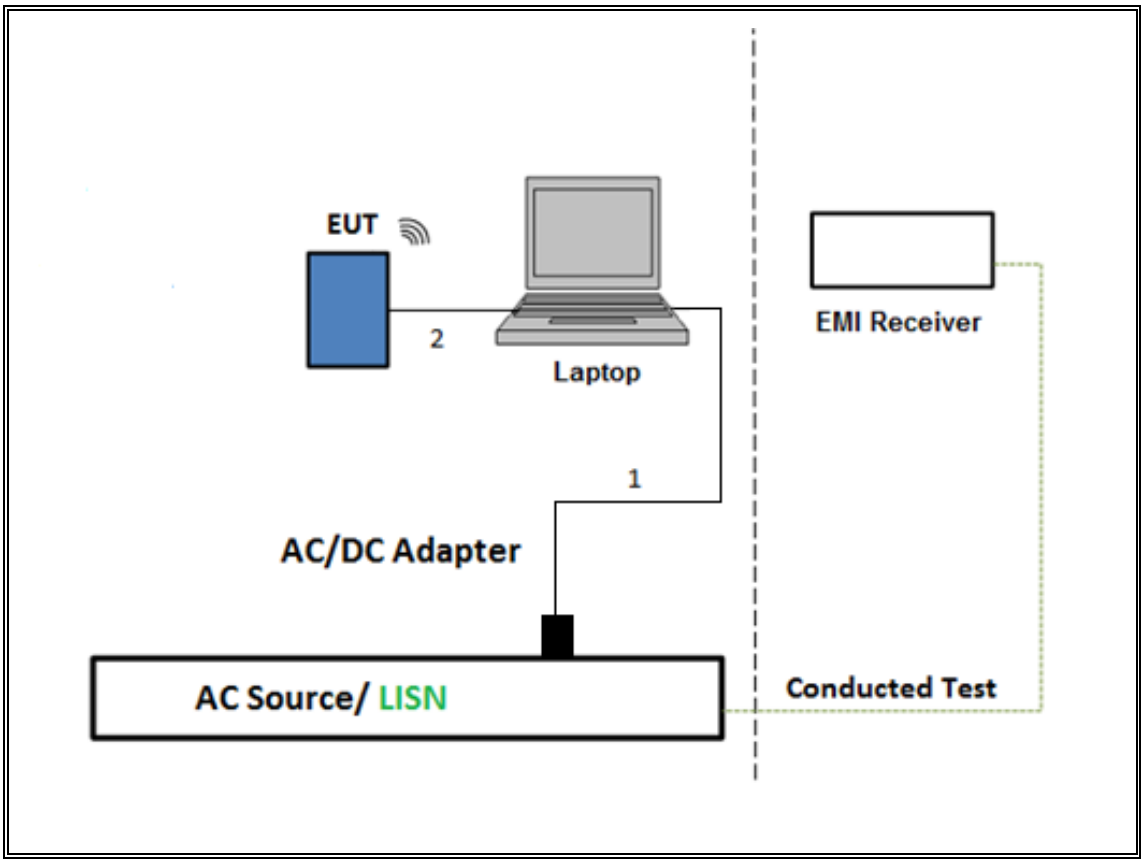
SETUP DIAGRAM FOR BELOW 1GHz and AC LINE CONDUCTED TEST



TEST SETUP- AC LINE CONDUCTED: LAPTOP CONFIGURATION



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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**	**ID Num**	**Cal Due**
Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T740	10/06/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T346	04/03/2019
Amplifier, 1 to 18GHz, 35dB	AMPLICAL	AMP1G18-35	138301	09/15/2019
Antenna, Broadband Hybrid, 30MHz to 2000MHz w/4dB Pad	Sunol Sciences Corp.	JB3	T477	07/24/2019
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	T286	06/04/2019
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T119	04/03/2019
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T227	10/28/2019
Antenna Horn, 18 to 26GHz	ARA	MWH-1826	T89	01/18/2019
Pre-Amp 18-26GHz	Agilent Technology	8449B	T404	03/09/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T341	09/26/2019
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T907	02/07/2019
Thermometer	Control Company	14-650-118, 15557603	T1816	01/11/2019
True RMS Multi Meter	Fluke Corporation	87V	T360	04/30/2019
AC Line Conducted				
EMI Test Receiver 9Khz-7GHz	Rohde & Schwarz	ESCI7	T1436	01/25/2019
Power Cable, Line Conducted Emissions	UL	PG1	T861	08/31/2019
**LISN for Conducted Emissions CISPR-16	Fischer	50/250-25-2-01	T1310	06/19/2019
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, April 26, 2016	
Conducted Software	UL	UL EMC	Ver 8.7, August 9, 2018	
AC Line Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015	

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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.

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8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

None; for reporting purposes only.

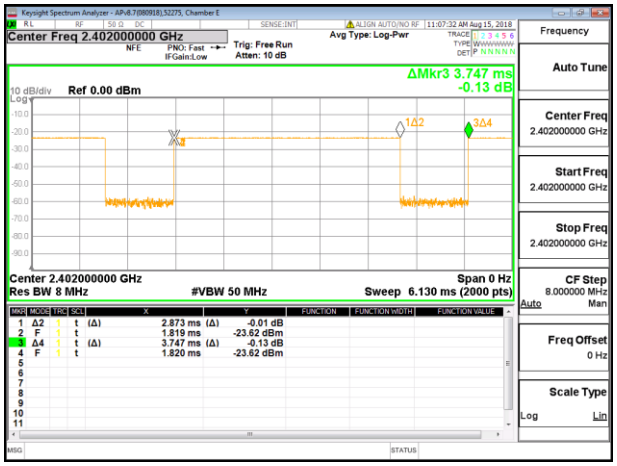
PROCEDURE

KDB 789033 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/T Minimum VBW (kHz)
Bluetooth GFSK	2.87	3.75	0.767	76.7%	1.15	0.348
Bluetooth 8PSK	1.98	3.75	0.529	52.9%	2.77	0.505

DUTY CYCLE PLOTS



BLUETOOTH GFSK

BLUETOOTH 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

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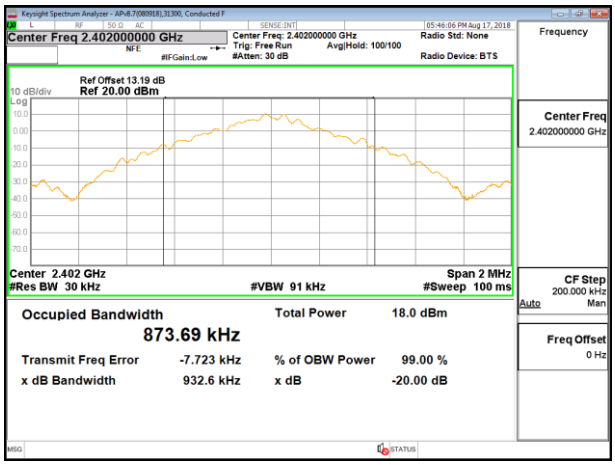
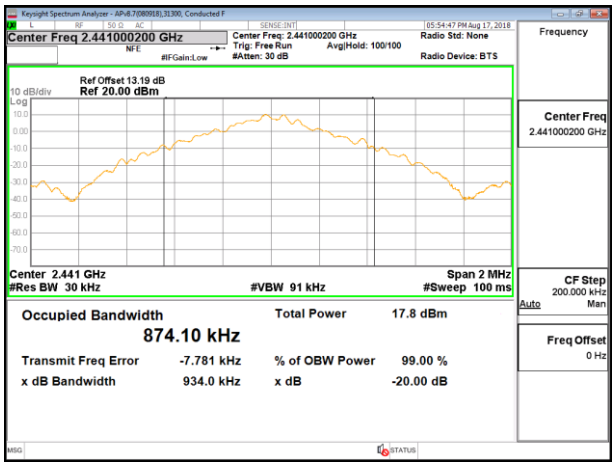
8.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

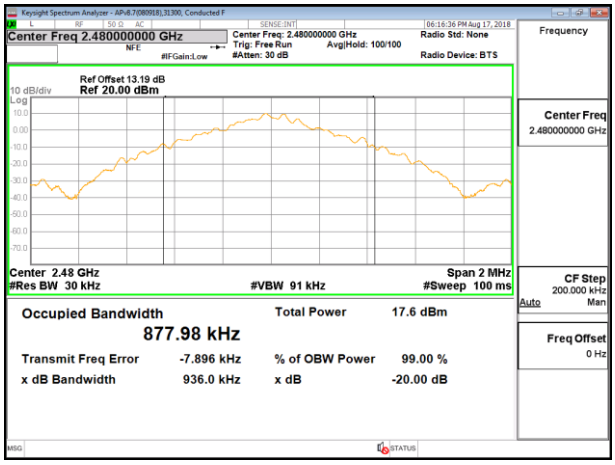
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.933	0.874
Mid	2441	0.934	0.874
High	2480	0.936	0.878



LOW CHANNEL



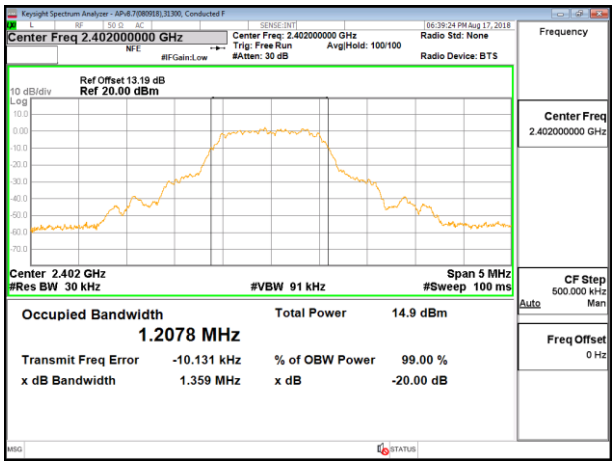
MID CHANNEL



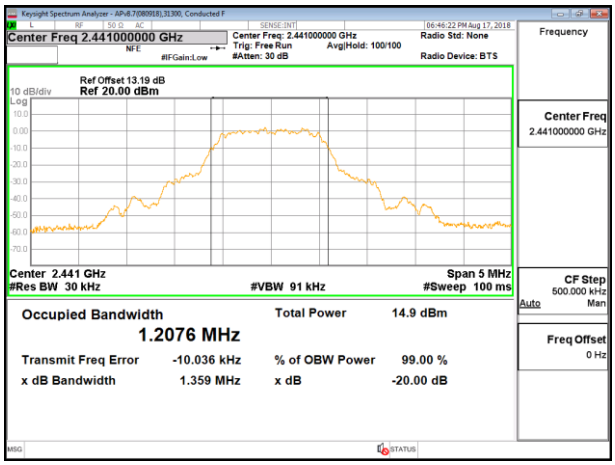
HIGH CHANNEL

8.2.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

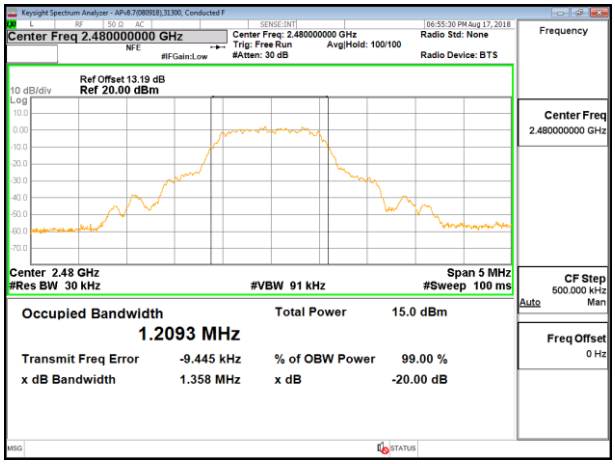
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.359	1.208
Mid	2441	1.359	1.208
High	2480	1.358	1.209



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

8.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

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.

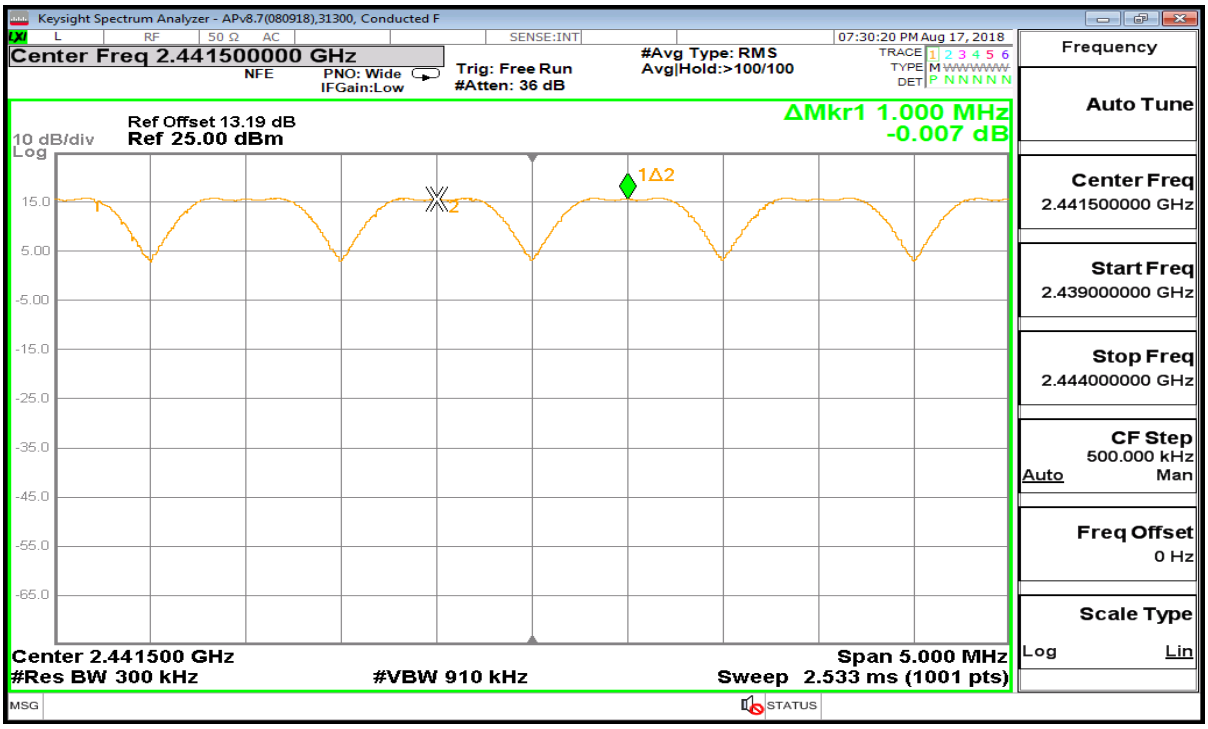
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

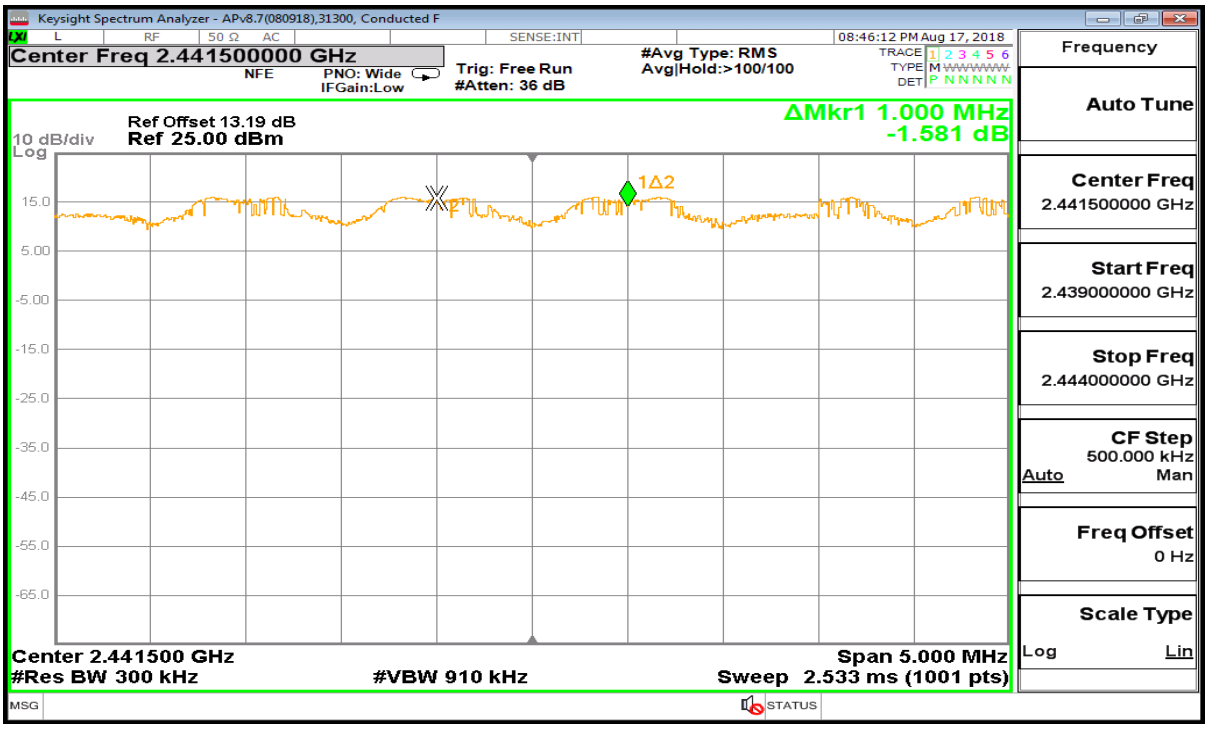
RESULTS

8.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

8.3.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION



HOPPING FREQUENCY SEPARATION PLOT

8.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

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

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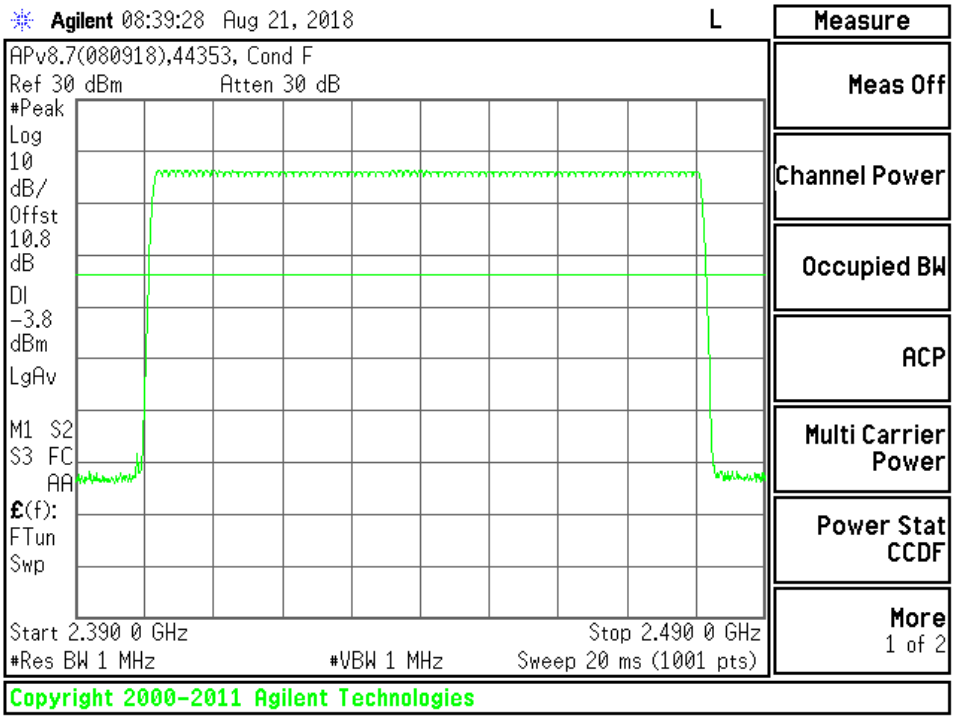
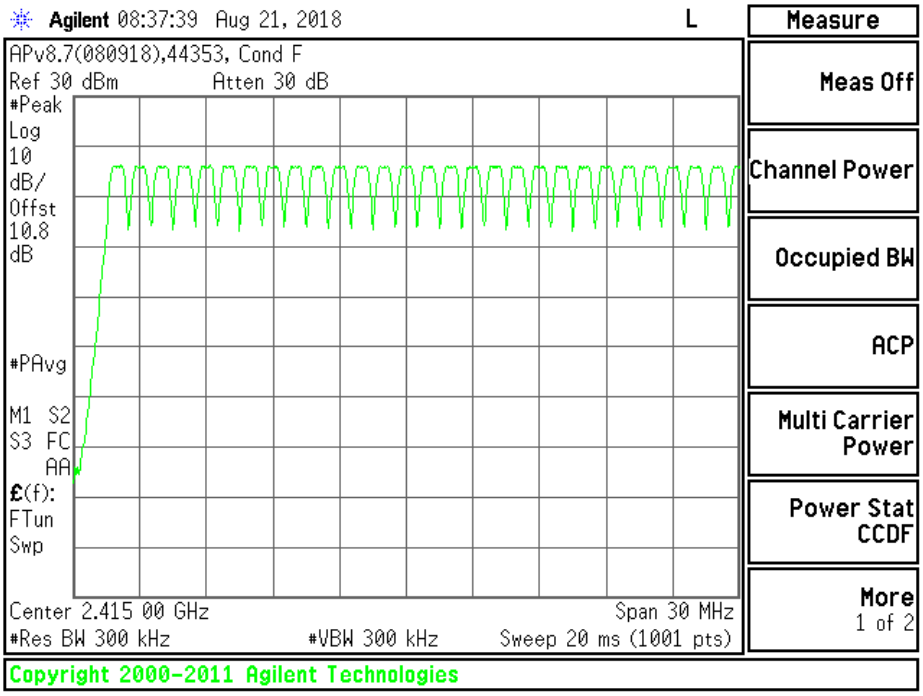
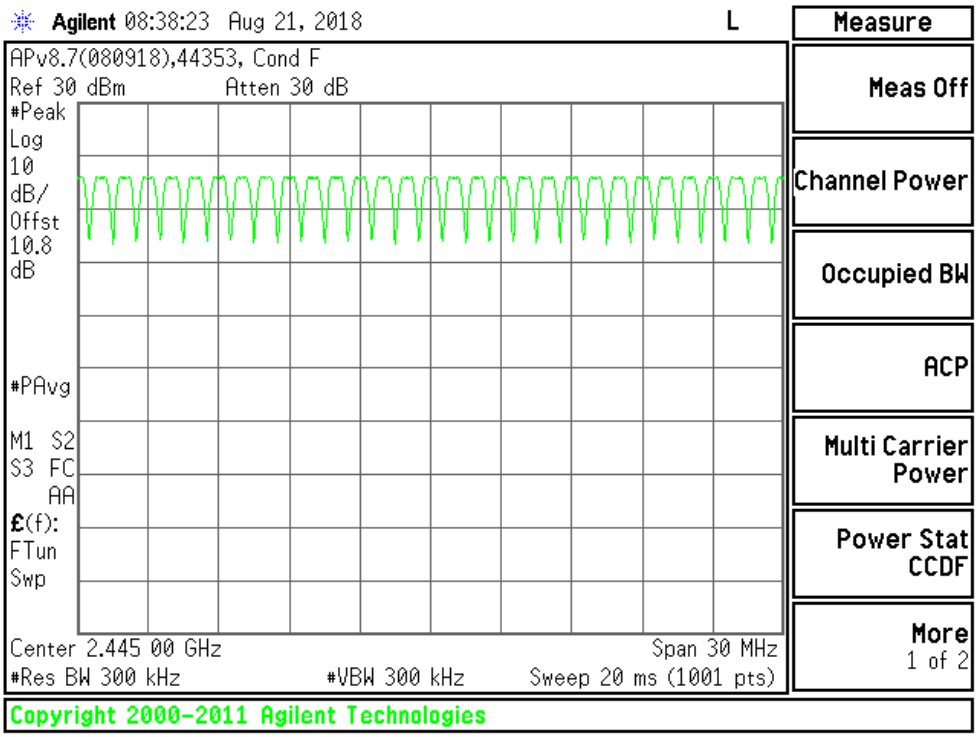
8.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

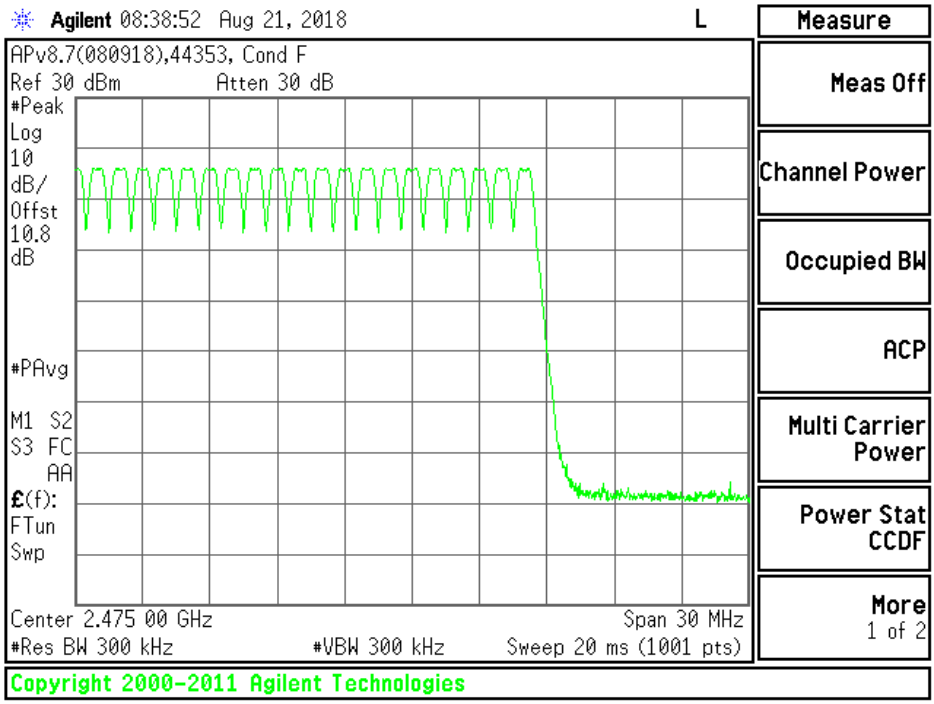




30MHz SPAN, SEGMENT 1 OF 3

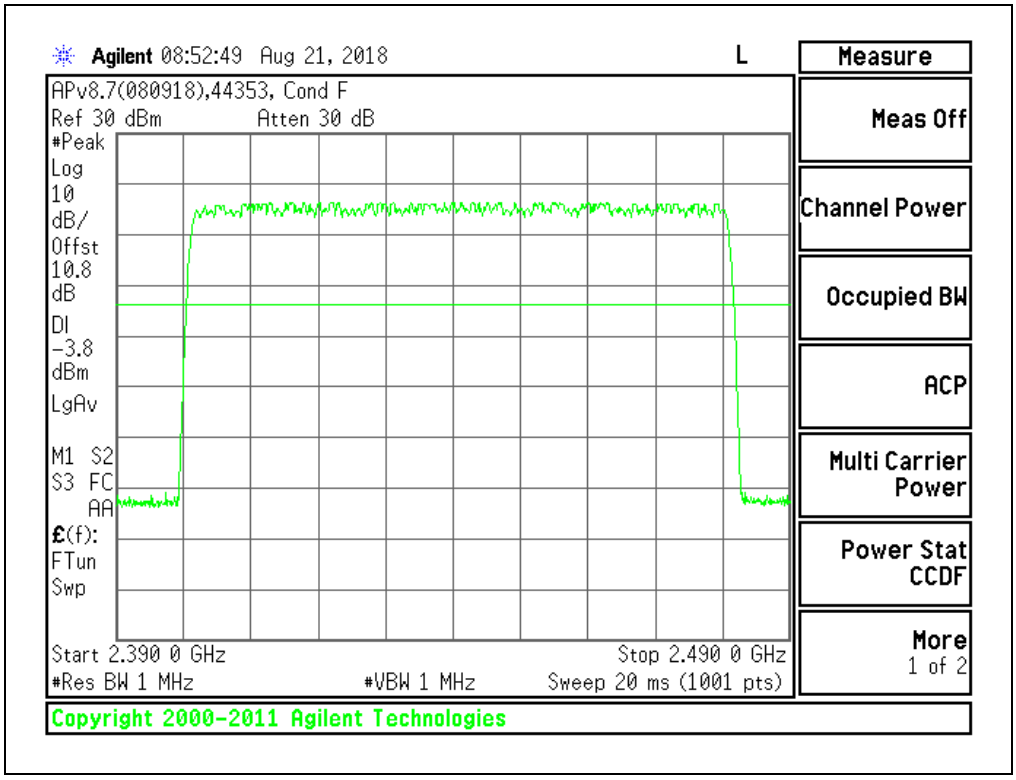


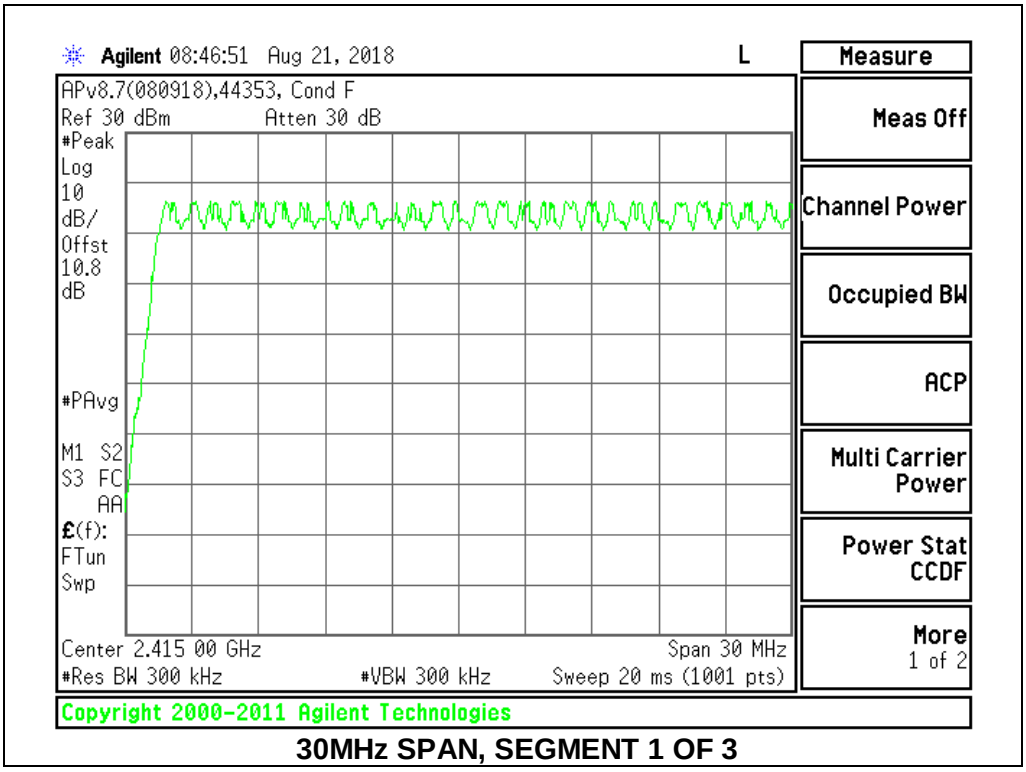
30MHz SPAN, SEGMENT 2 OF 3



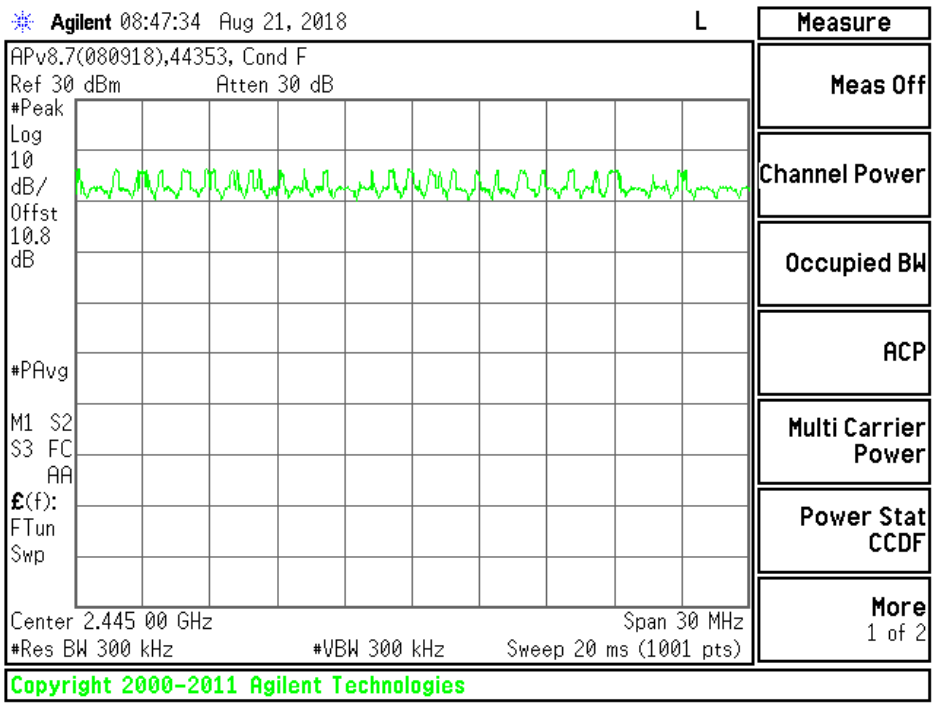
30MHz SPAN, SEGMENT 3 OF 3

8.4.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

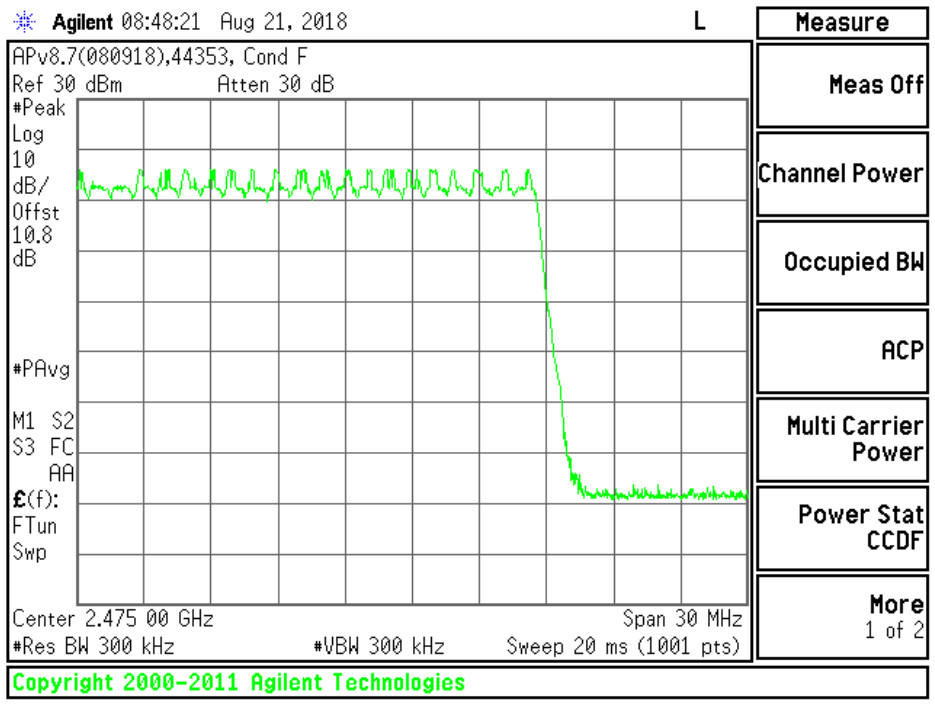




30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

8.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

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 3.16 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

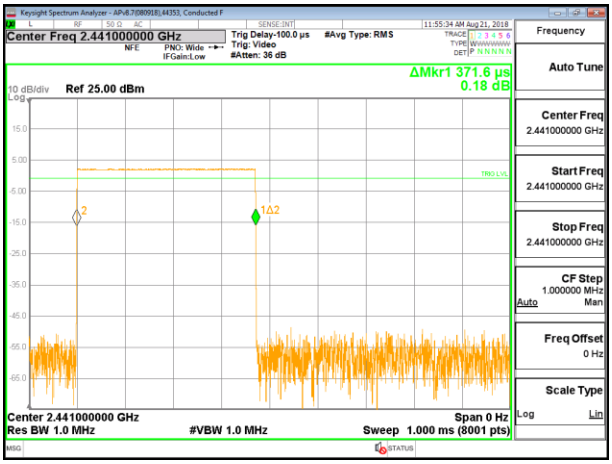
For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

RESULTS

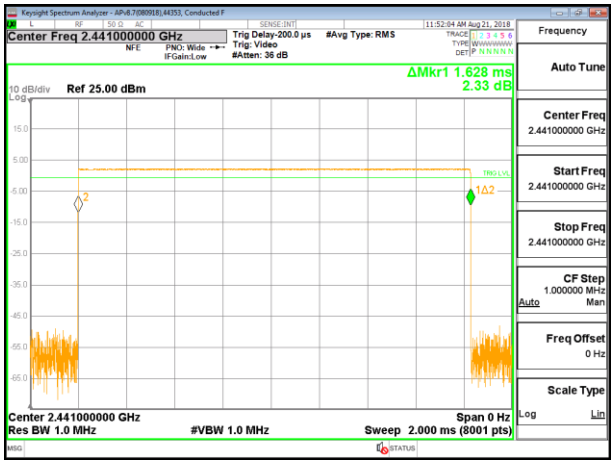
UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

8.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

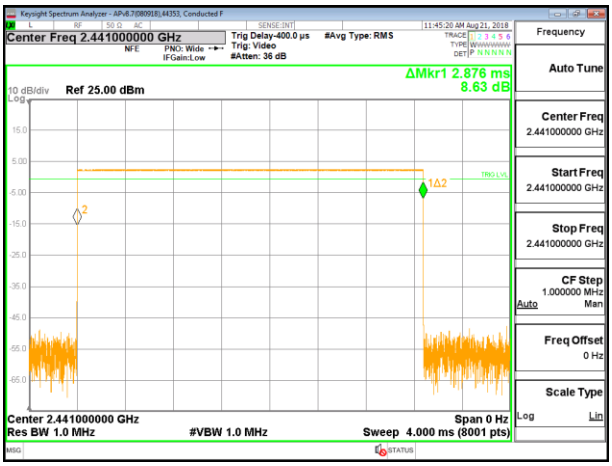
DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK Normal Mode					
DH1	0.372	32	0.1190	0.4	-0.2810
DH3	1.628	16	0.2605	0.4	-0.1395
DH5	2.876	11	0.3164	0.4	-0.0836
DH Packet	Pulse Width (sec)	Number of Pulses in 0.8 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
GFSK AFH Mode					
DH1	0.372	8	0.02976	0.4	-0.3702
DH3	1.628	4	0.06512	0.4	-0.3349
DH5	2.876	2.75	0.07909	0.4	-0.3209



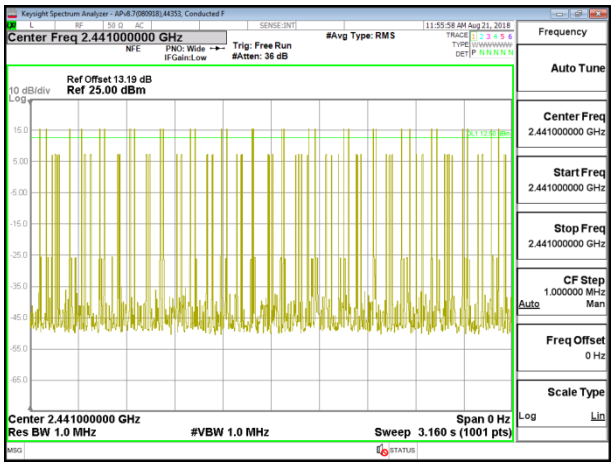
PULSE WIDTH – DH1



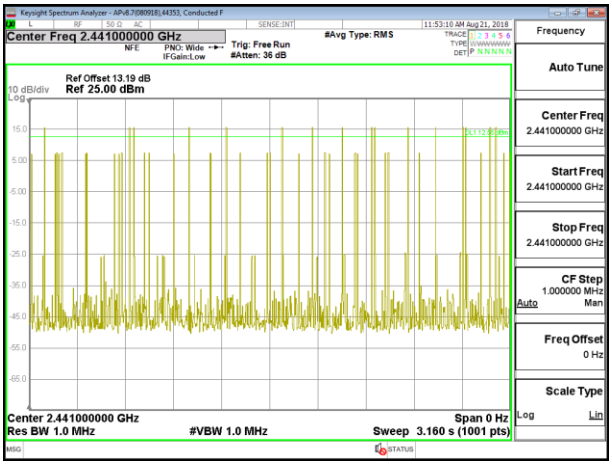
PULSE WIDTH – DH3



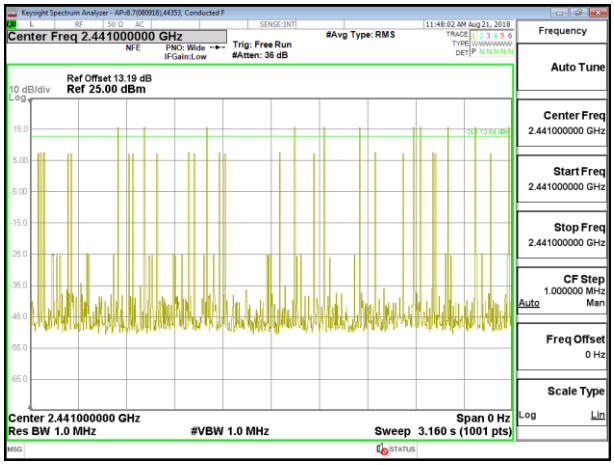
PULSE WIDTH – DH5



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

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8.5.2. BLUETOOTH ENCHANCED 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 Normal Mode					
3DH1	0.382	32	0.12224	0.4	-0.2778
3DH3	1.632	17	0.27744	0.4	-0.1226
3DH5	2.884	10	0.2884	0.4	-0.1116

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.

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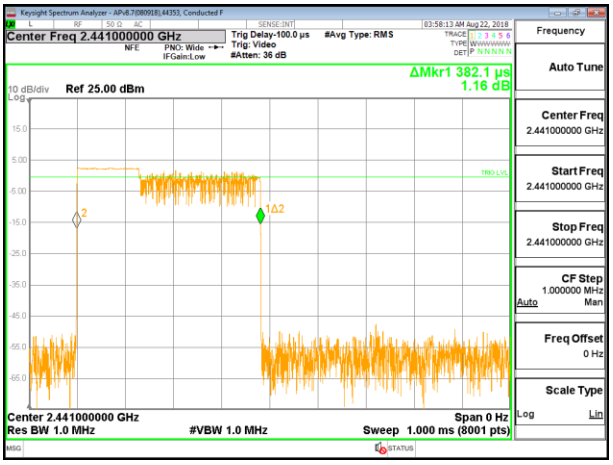
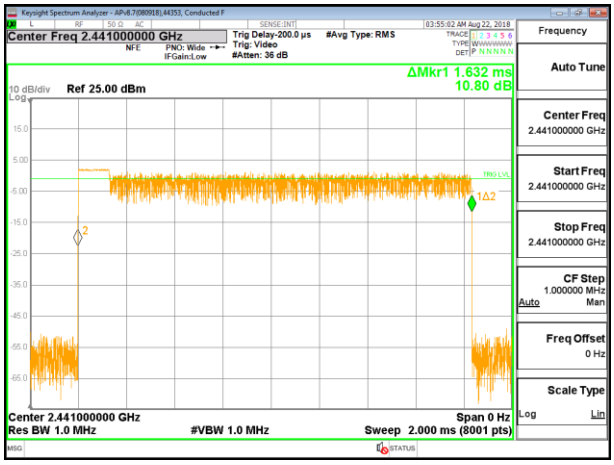
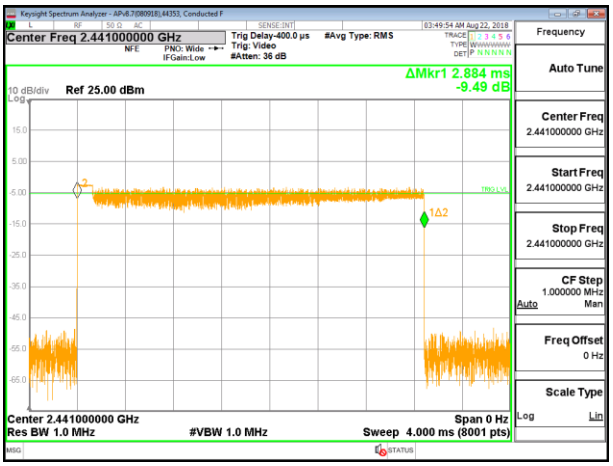


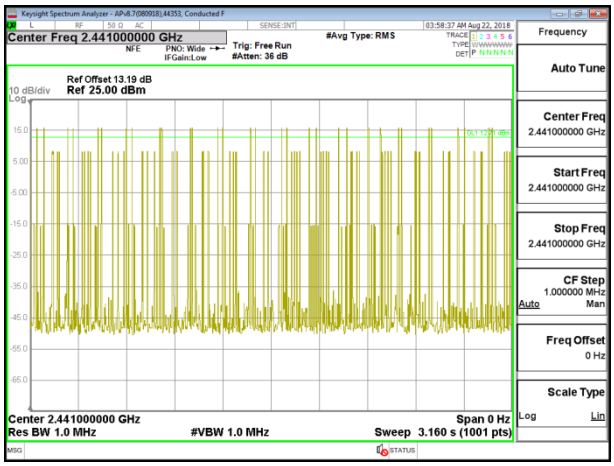
PULSE WIDTH – 3DH1



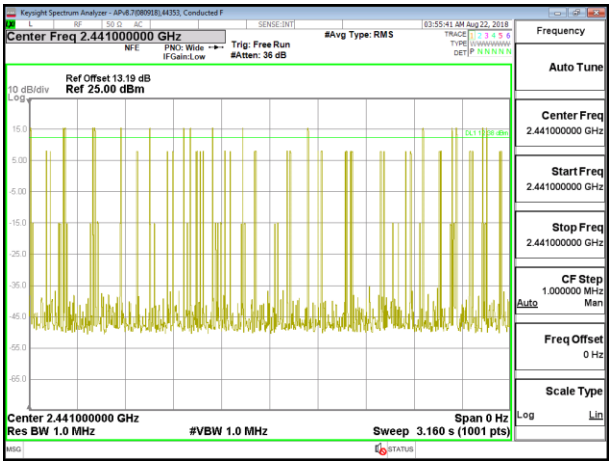
PULSE WIDTH – 3DH3



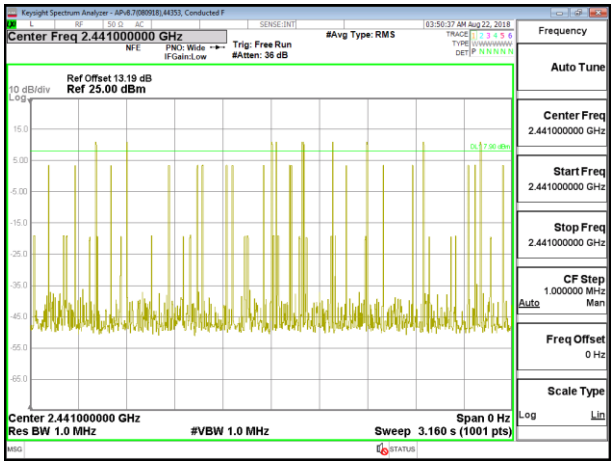
PULSE WIDTH – 3DH5



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

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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

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated peak reading of power.

RESULTS

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47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

8.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	44366
Date:	3/15/2019

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.48	30	-17.52
Middle	2441	12.60	30	-17.40
High	2480	12.41	30	-17.59

8.6.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

Tested By:	44366
Date:	3/15/2019

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	13.23	21	-7.77
Middle	2441	13.11	21	-7.89
High	2480	13.08	21	-7.92

8.6.3. BLUETOOTH ENCHANCED DATA RATE DQPSK MODULATION

Tested By:	44366
Date:	3/15/2019

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.98	21	-8.02
Middle	2441	13.10	21	-7.90
High	2480	13.05	21	-7.95

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8.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss of 10.5 dB (including 10 dB pad and 0.5 dB cable) was entered as an offset in the power meter to allow for a gated average reading of power.

RESULTS

UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

8.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	44366
Date	3/15/2019

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	12.21
Middle	2441	12.40
High	2480	12.18

8.7.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

Tested By:	44366
Date	3/15/2019

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.88
Middle	2441	9.83
High	2480	9.68

8.7.3. BLUETOOTH ENCHANCED DATA RATE DQPSK MODULATION

Tested By:	44366
Date	3/15/2019

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	9.89
Middle	2441	9.88
High	2480	9.48

8.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

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

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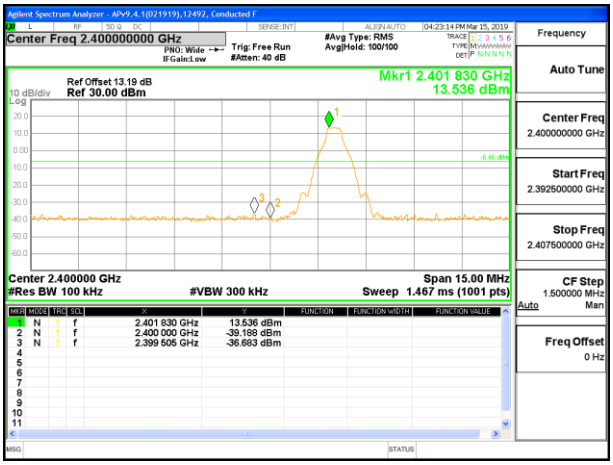
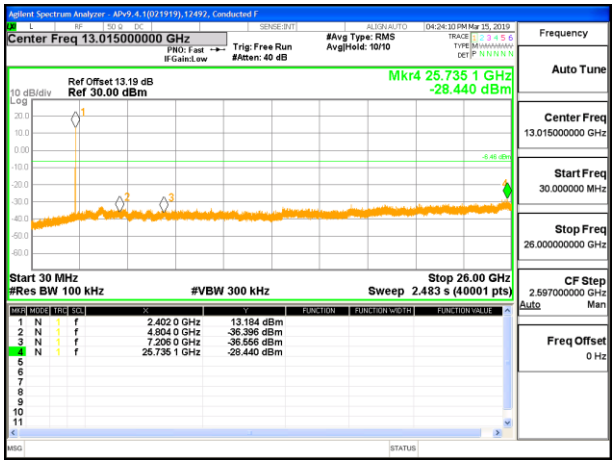
8.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

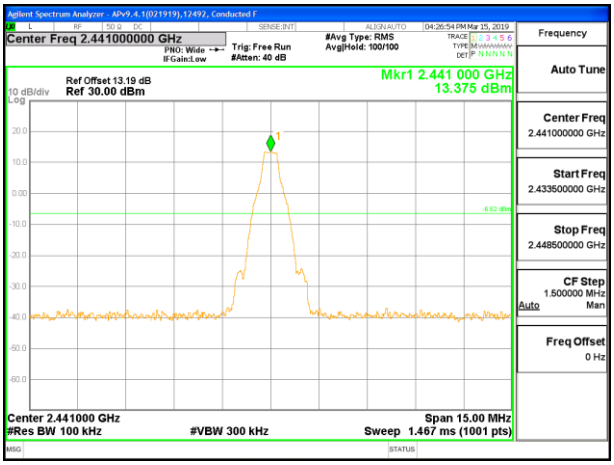
Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



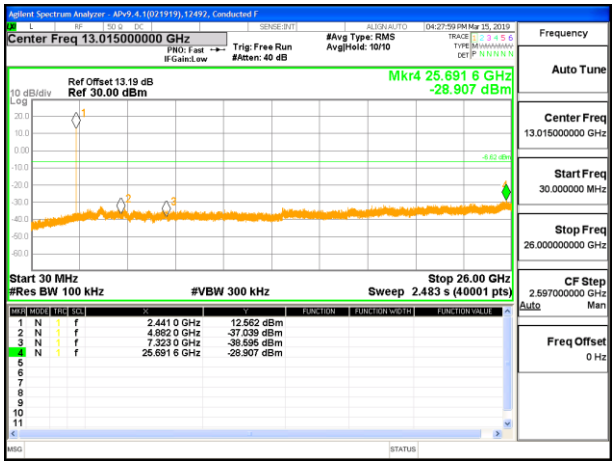
LOW CHANNEL BANDEDGE



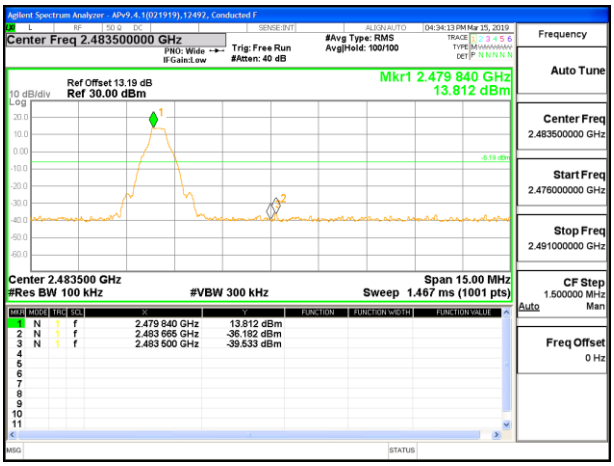
OUT-OF-BAND LOW CHANNEL



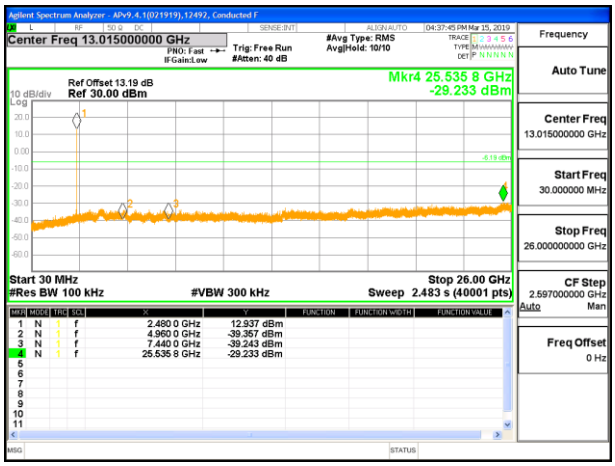
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

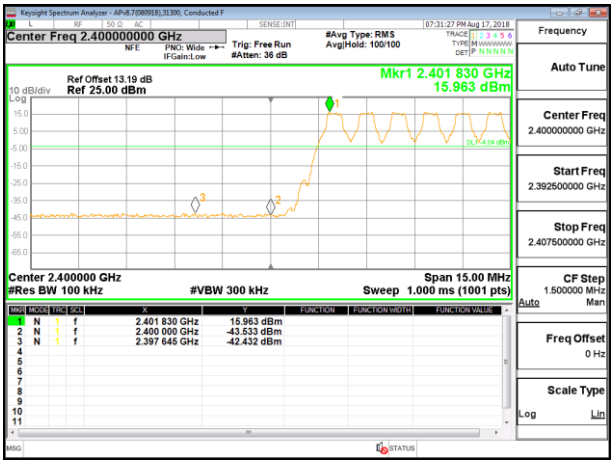


HIGH CHANNEL BANDEDGE

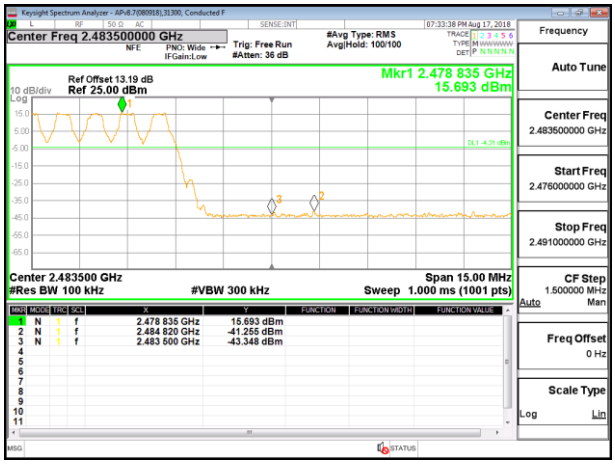


OUT-OF-BAND HIGH CHANNEL

Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE

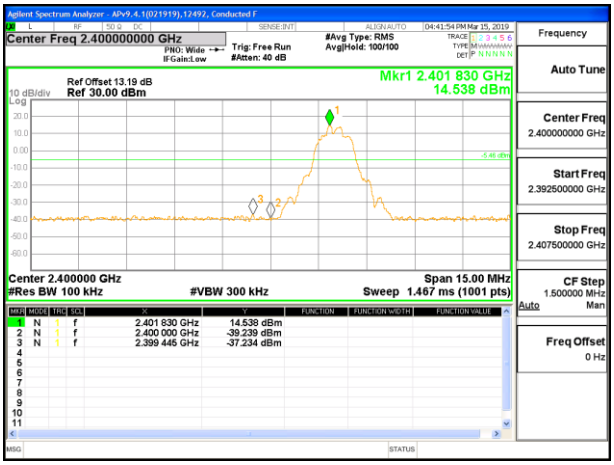


HIGH BANDEDGE

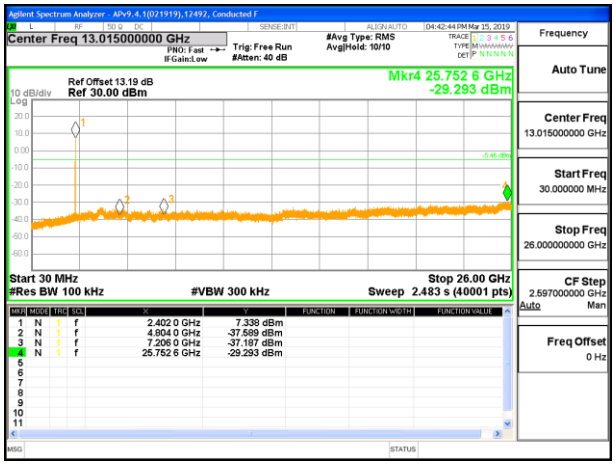
UL VERIFICATION SERVICES INC.
47173 Benicia Street, Fremont, CA 94538; USA TEL:(510) 319-4000 FAX:(510) 661-0888

8.8.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

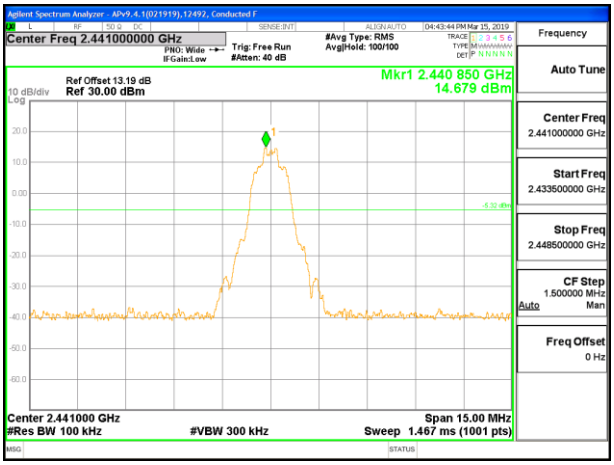
Antenna 1 SPURIOUS EMISSIONS, NON-HOPPING



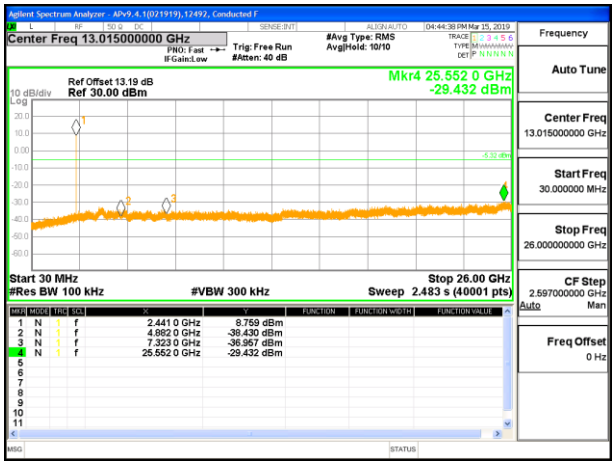
LOW CHANNEL BANDEDGE



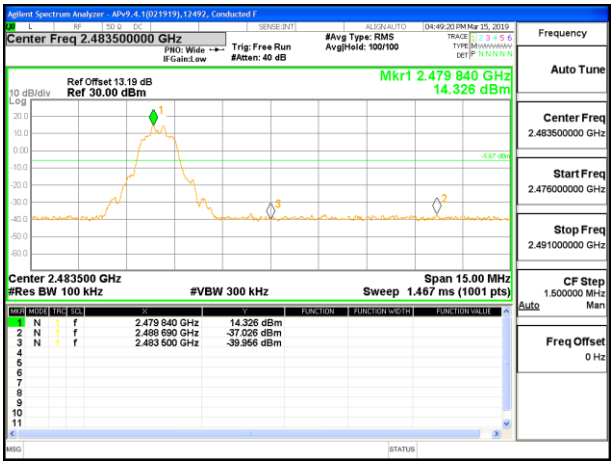
OUT-OF-BAND LOW CHANNEL



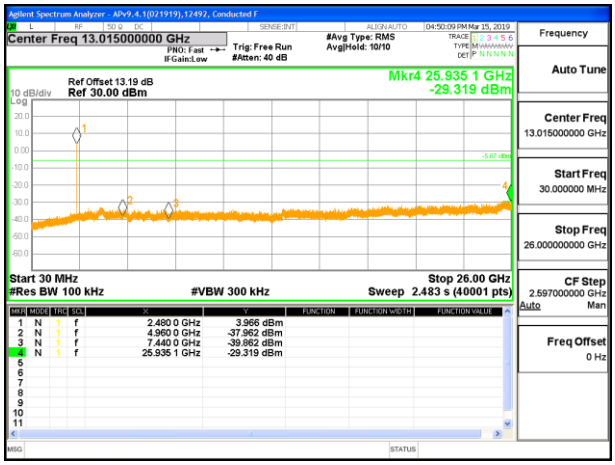
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

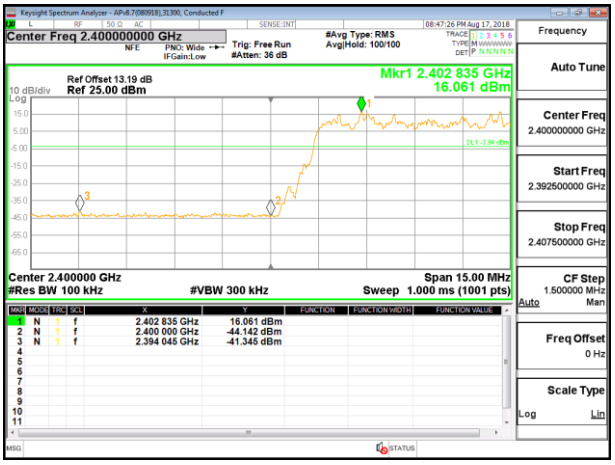


HIGH CHANNEL BANDEDGE

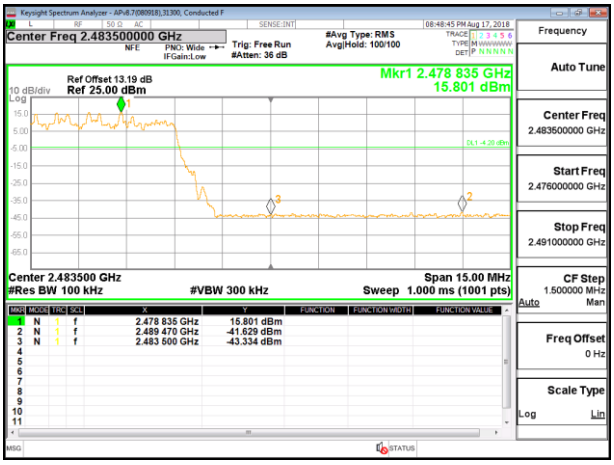


OUT-OF-BAND HIGH CHANNEL

Antenna 1 SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

9. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

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) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	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 (510KHz) video bandwidth with peak detector for average measurements.

The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

For the Band edge measurement, there is no need for the average reading since the peak reading passed with the peak limit. The average reading = peak reading – 20*log (1/duty cycle), and the 20*log (1/duty cycle) is greater than 20dB

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.

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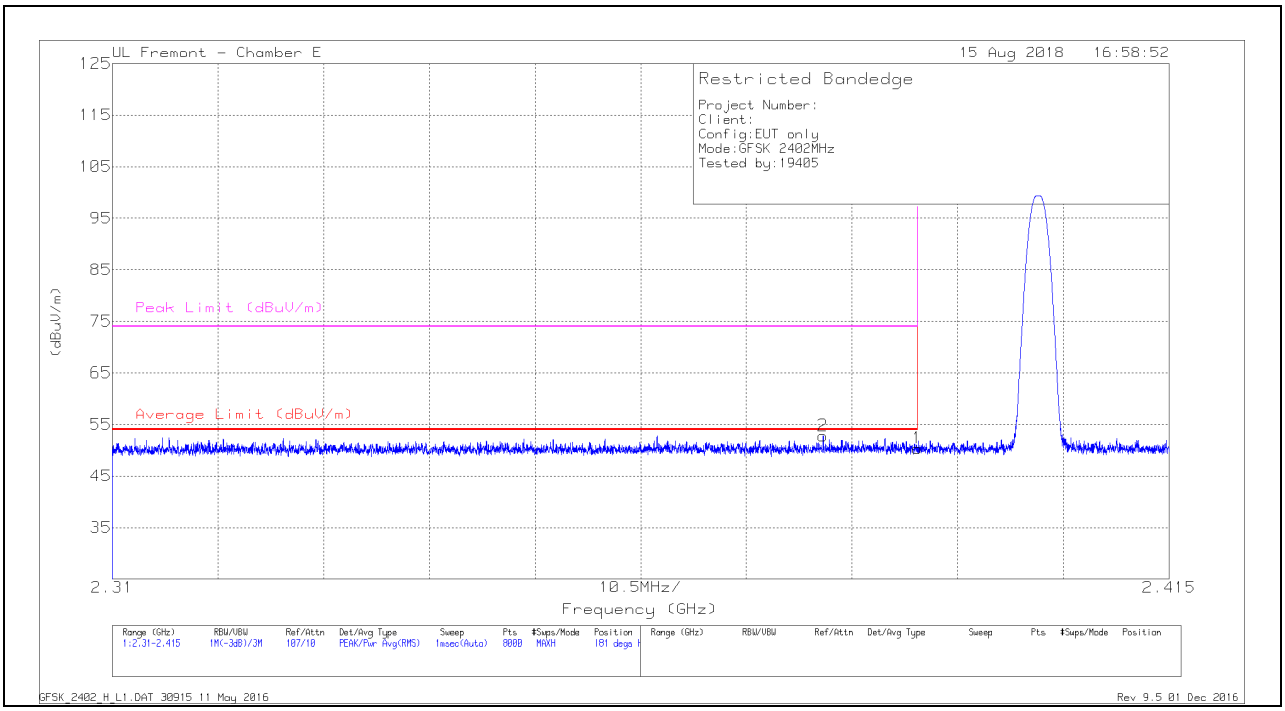
9.1. TRANSMITTER ABOVE 1 GHz

9.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

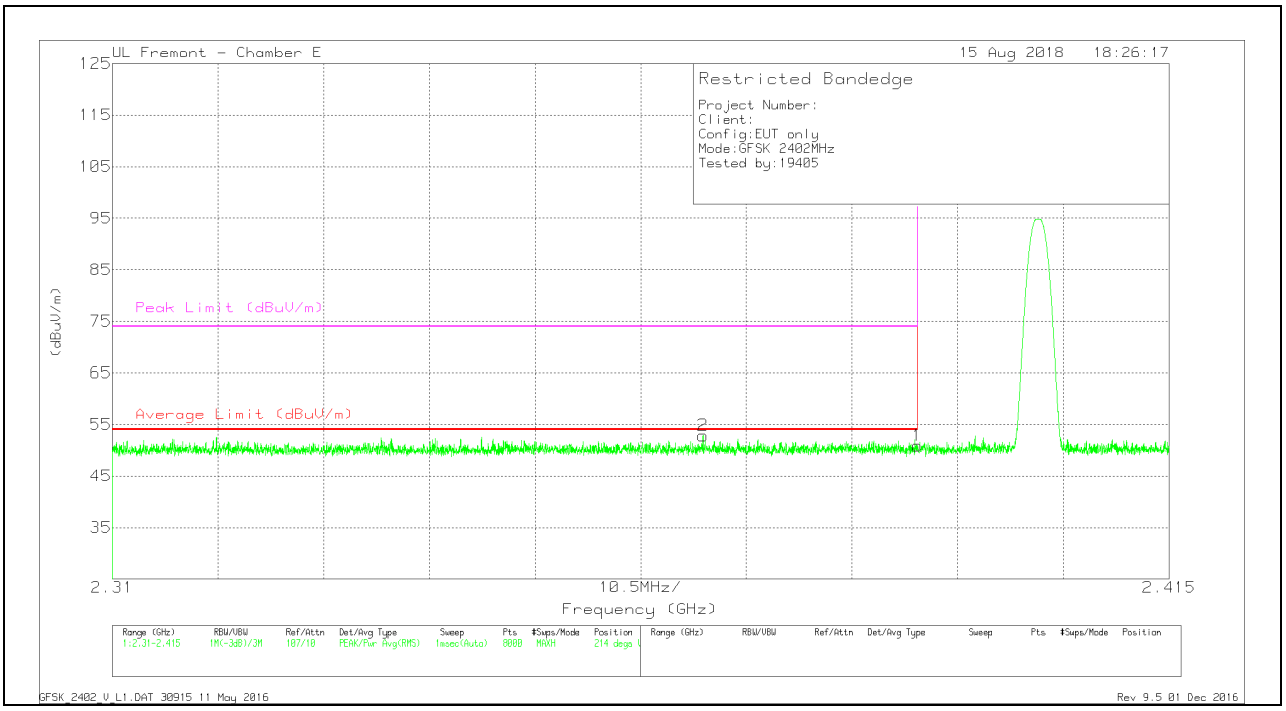
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/ Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.98	Pk	32	-22.6	50.38	74	-23.62	181	119	H
2	* 2.381	43.49	Pk	31.9	-22.6	52.79	74	-21.21	181	119	H

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

VERTICAL RESULT

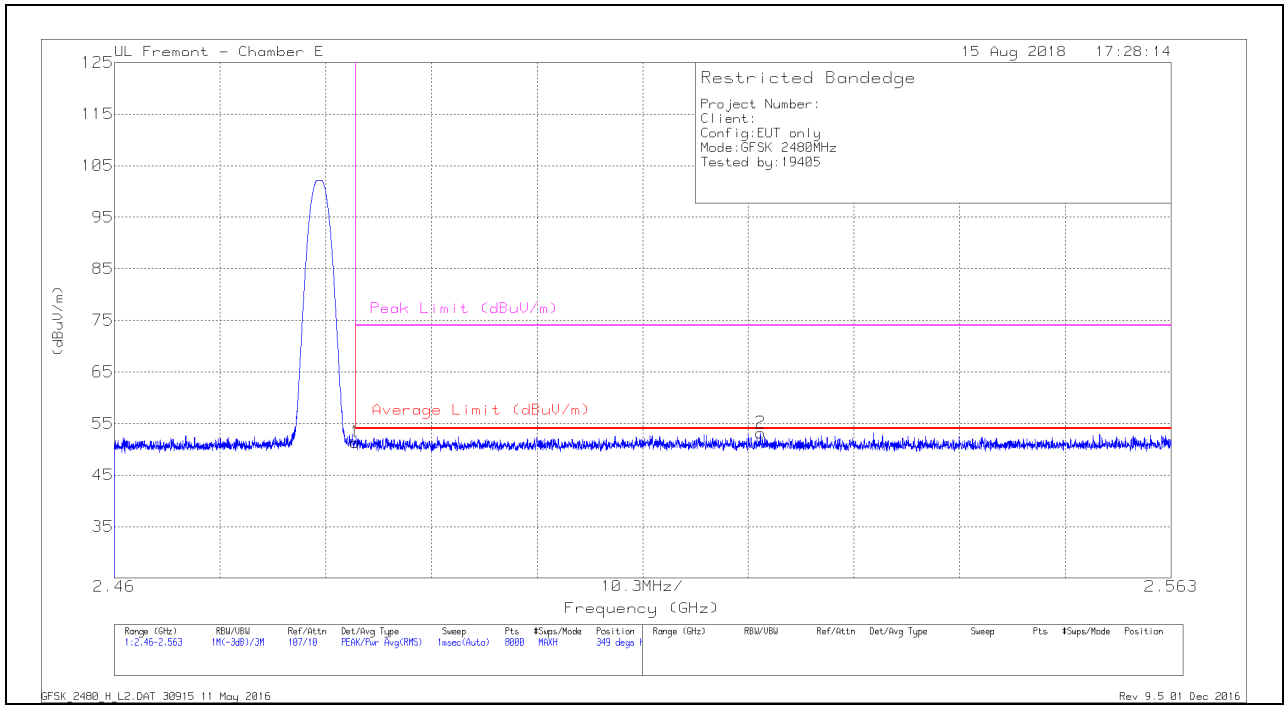


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.49	Pk	32	-22.6	50.89	74	-23.11	214	381	V
2	* 2.369	43.65	Pk	31.9	-22.7	52.85	74	-21.15	214	381	V

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

BANDEDGE (HIGH CHANNEL)

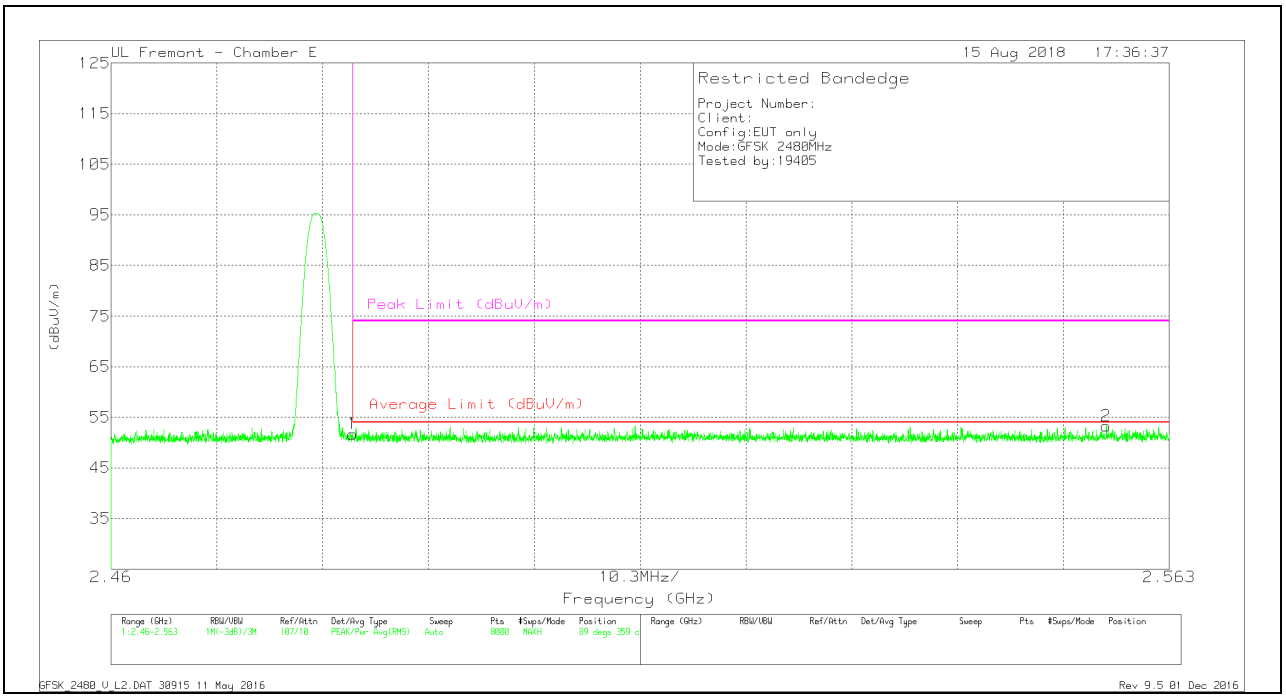
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.56	Pk	32.1	-22.3	51.36	74	-22.64	349	111	H
2	2.523	43.38	Pk	32.1	-22.3	53.18	74	-20.82	349	111	H

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

VERTICAL RESULT

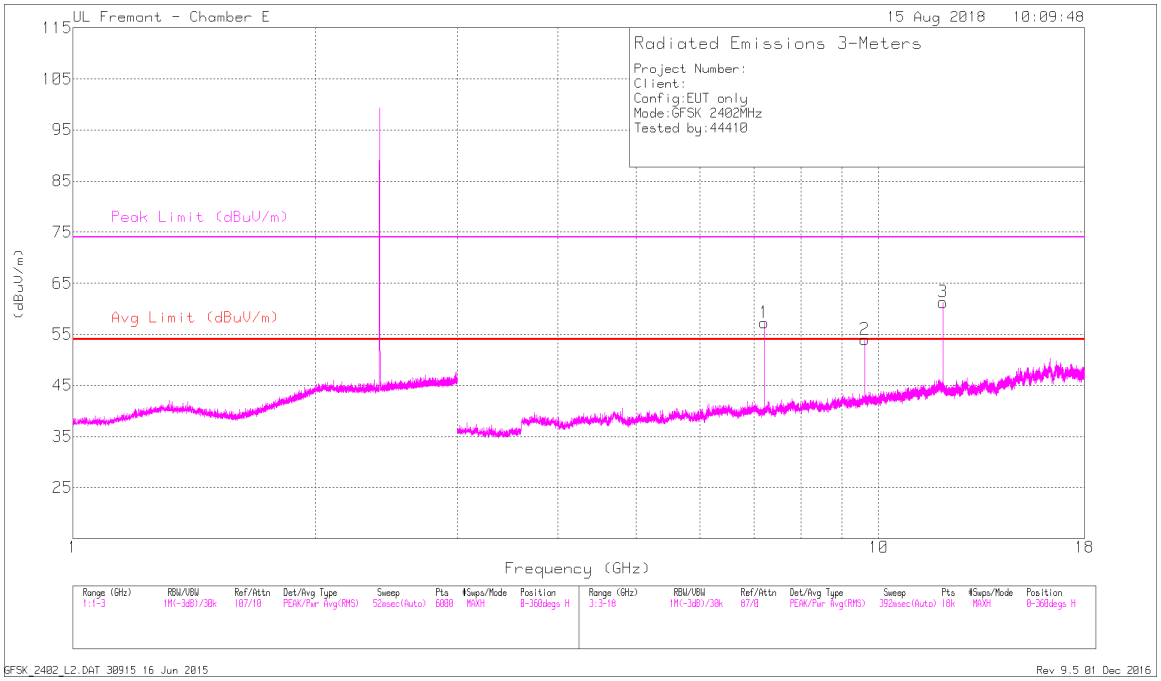


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	41.92	Pk	32.1	-22.3	51.72	74	-22.28	89	359	V
2	2.557	43.46	Pk	32.1	-22.3	53.26	74	-20.74	89	359	V

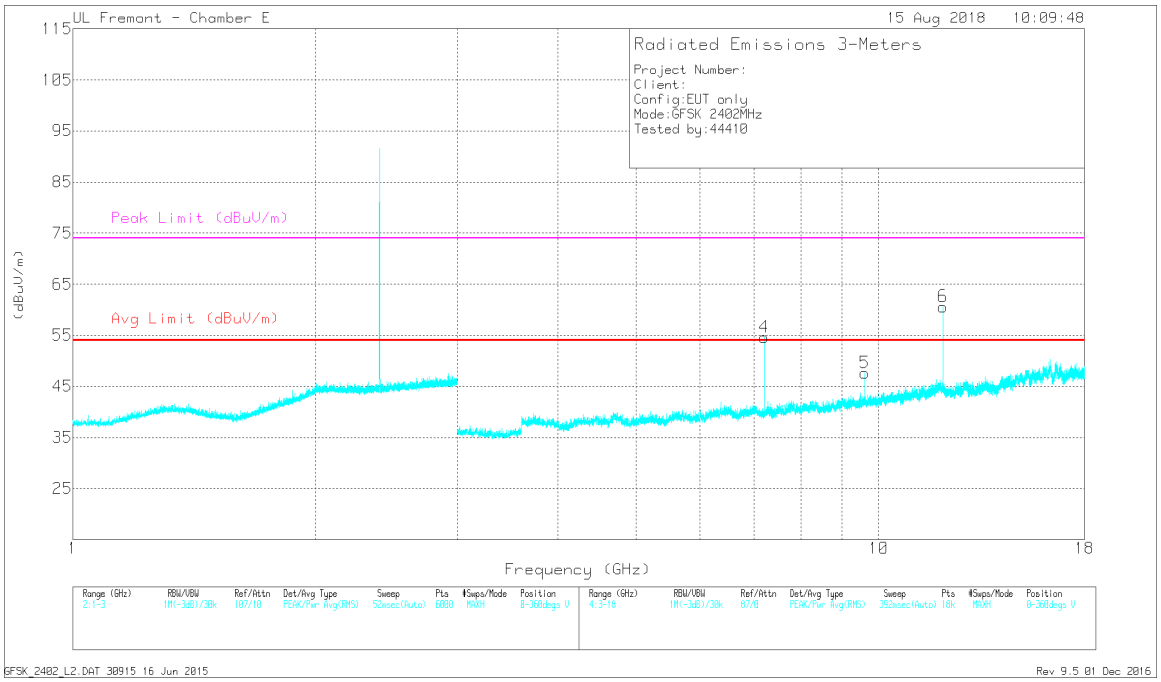
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 12.01	46.76	PKFH	39.7	-23.4	63.06	74	-10.94	72	109	H
6	* 12.011	46.74	PKFH	39.7	-23.4	63.04	74	-10.96	306	106	V
1	7.205	49.73	PKFH	36.1	-26.8	59.03	-	-	225	118	H
4	7.206	48.36	PKFH	36.1	-26.8	57.66	-	-	304	220	V
5	9.607	38.83	PKFH	37.3	-23.8	52.33	-	-	81	108	V
2	9.608	42.5	PKFH	37.3	-23.9	55.9	-	-	217	123	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RBW=1MHz VB=3 x RBW, Peak

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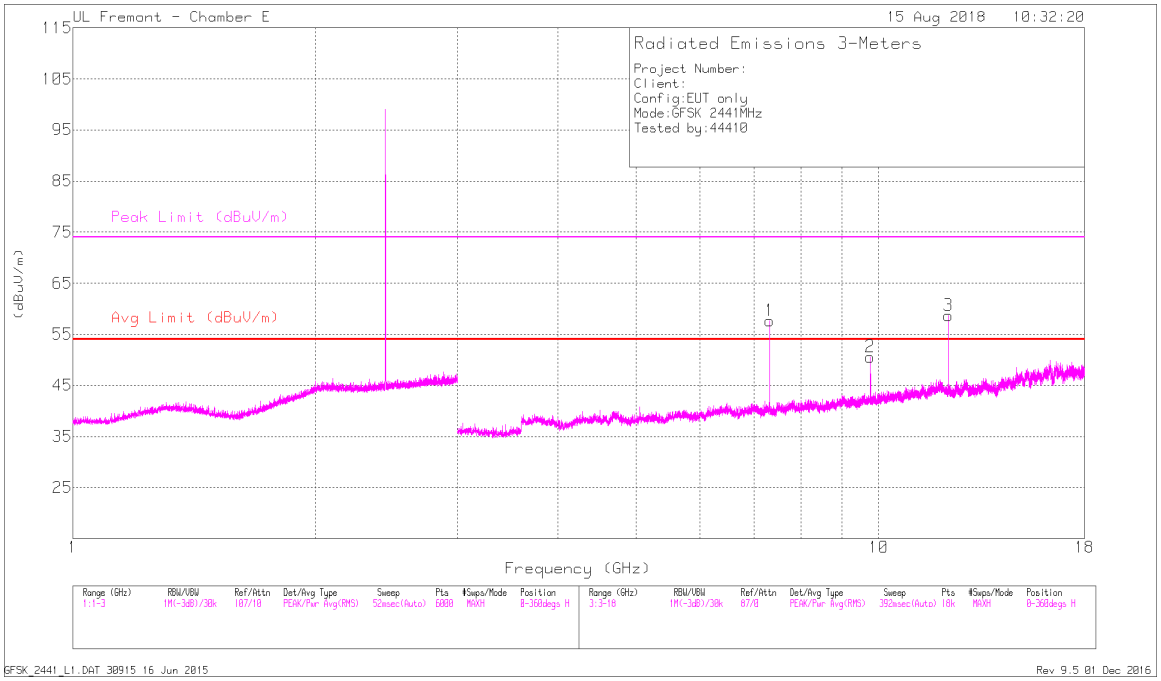
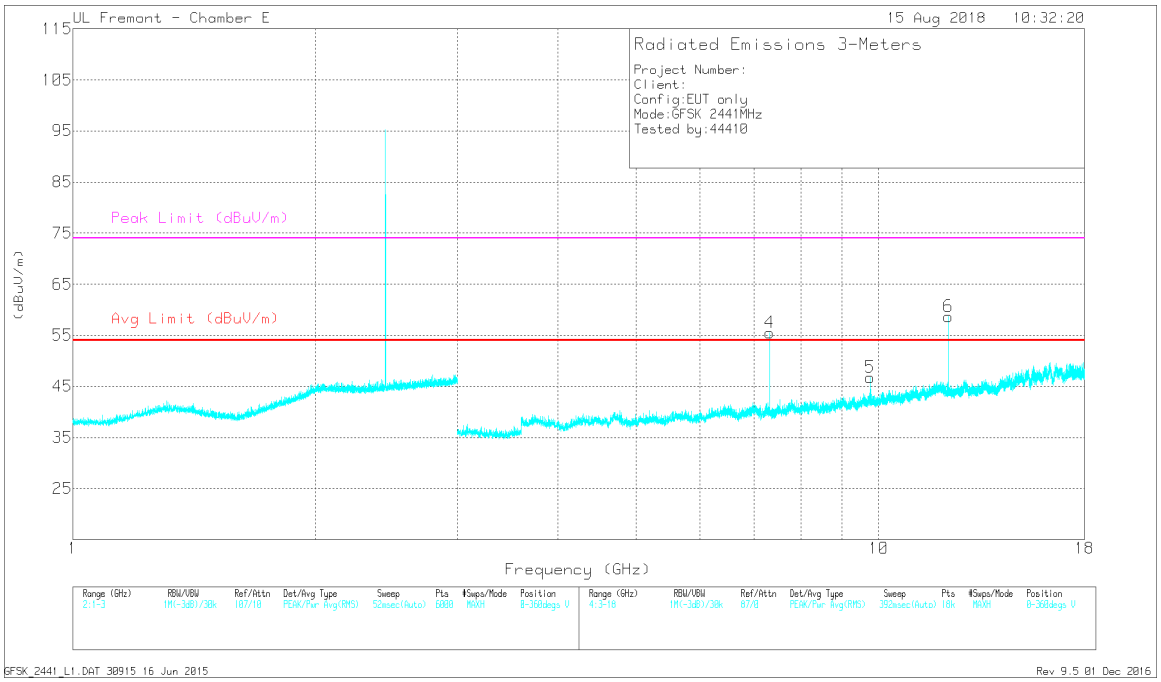
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Markers	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 7.324	50.16	PKFH	36	-26.1	60.06	74	-13.94	226	103	H
3	* 12.206	44.69	PKFH	39	-22.8	60.89	74	-13.11	59	103	H
4	* 7.324	49.69	PKFH	36	-26.1	59.59	74	-14.41	257	269	V
6	* 12.204	43	PKFH	39	-22.8	59.2	74	-14.8	134	112	V
5	9.764	38	PKFH	37.5	-23.8	51.7	-	-	280	119	V
2	9.765	42.58	PKFH	37.5	-23.8	56.28	-	-	231	104	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RBW=1MHz VBW=3 x RBW, Peak

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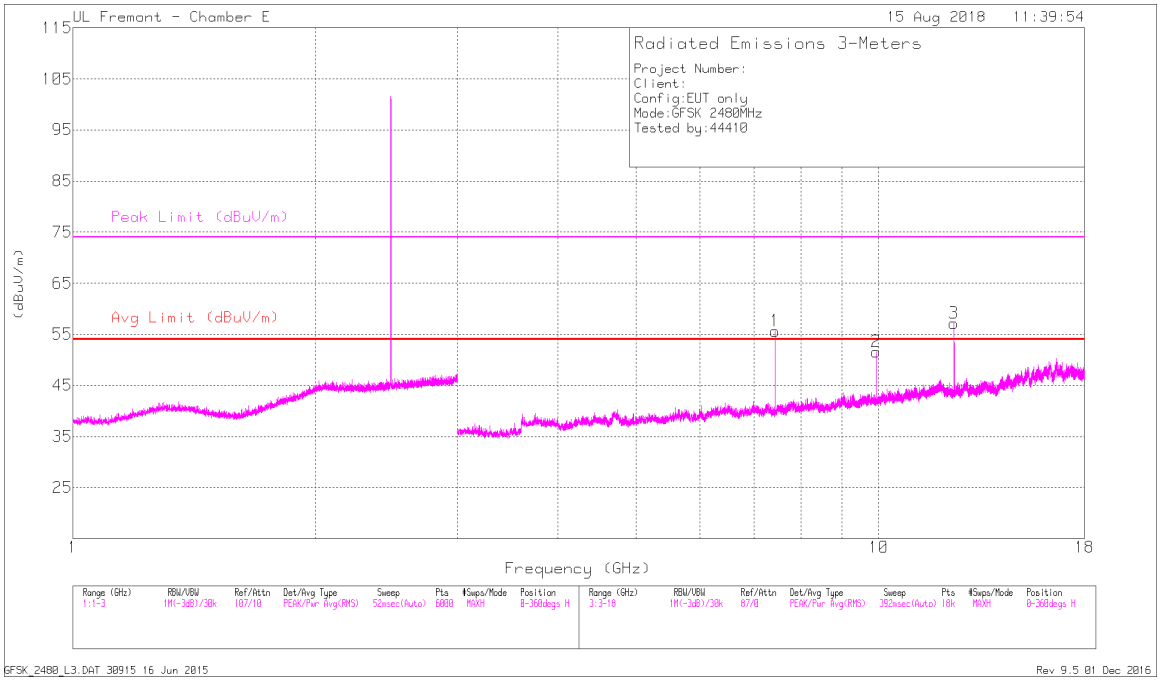
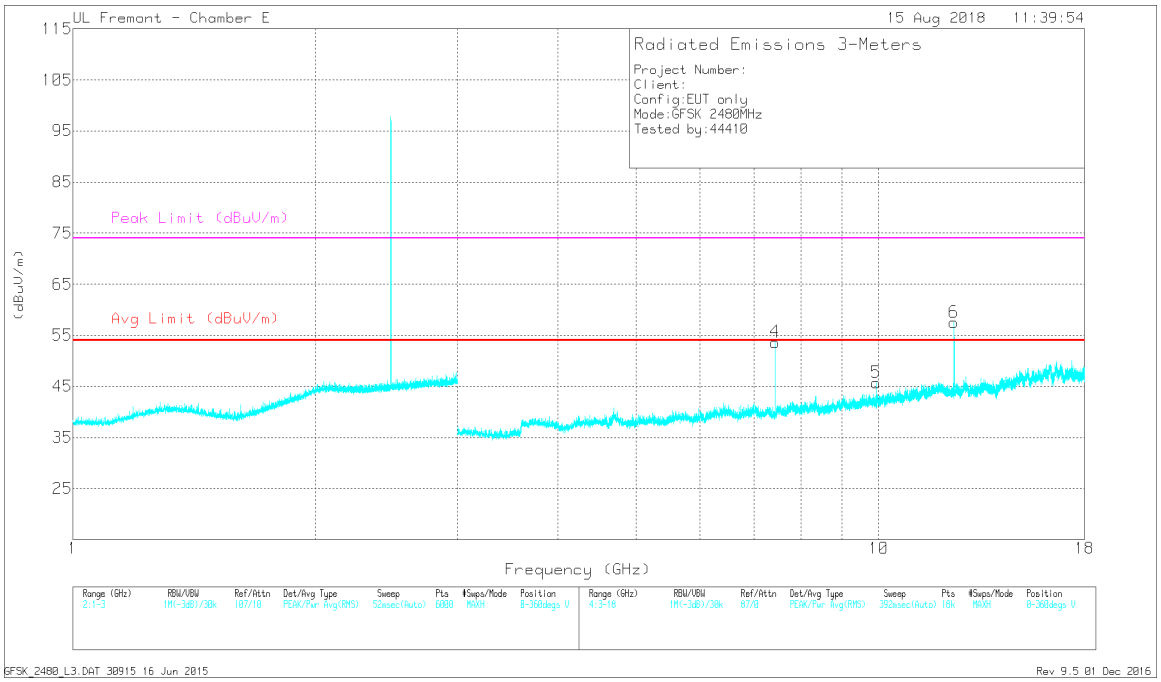
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

7	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 7.44	48.15	PKFH	36.1	-26.8	57.45	74	-16.55	198	127	H
3	* 12.401	44.28	PKFH	38.6	-23.4	59.48	74	-14.52	61	103	H
4	* 7.44	48.17	PKFH	36.1	-26.8	57.47	74	-16.53	241	218	V
6	* 12.401	44.88	PKFH	38.6	-23.4	60.08	74	-13.92	124	108	V
2	9.919	42.71	PKFH	37.6	-24.3	56.01	-	-	227	103	H
5	9.919	37.66	PKFH	37.6	-24.3	50.96	-	-	100	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RBW=1MHz VBW=3 x RBW, Peak

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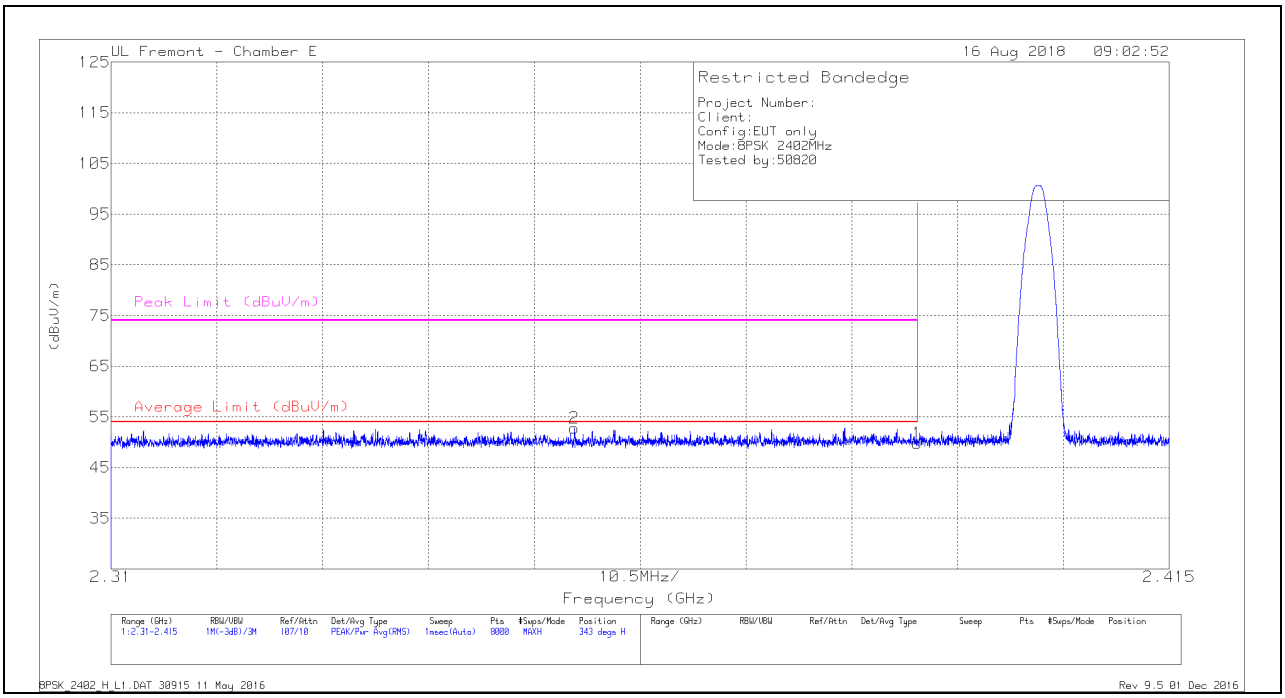
9.1.2. BLUETOOTH ENCHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

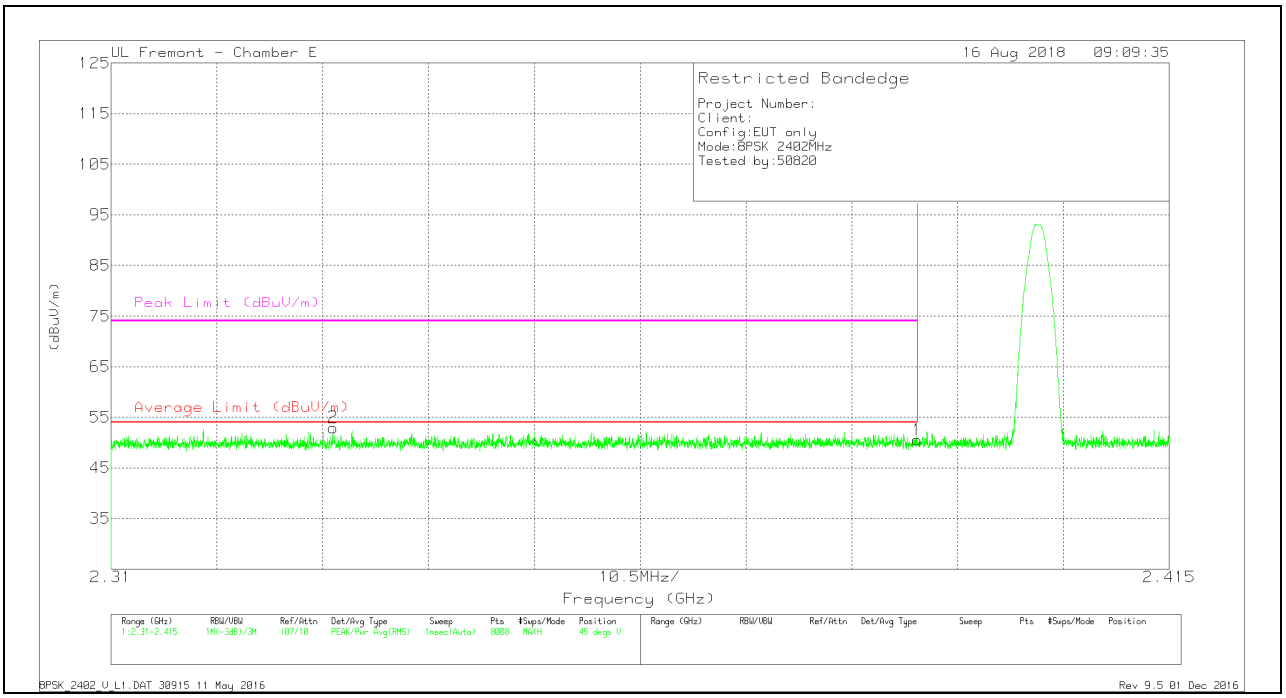
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl /Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.36	Pk	32	-22.6	49.76	74	-24.24	343	127	H
2	* 2.356	43.6	Pk	31.9	-22.7	52.8	74	-21.2	343	127	H

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

VERTICAL RESULT

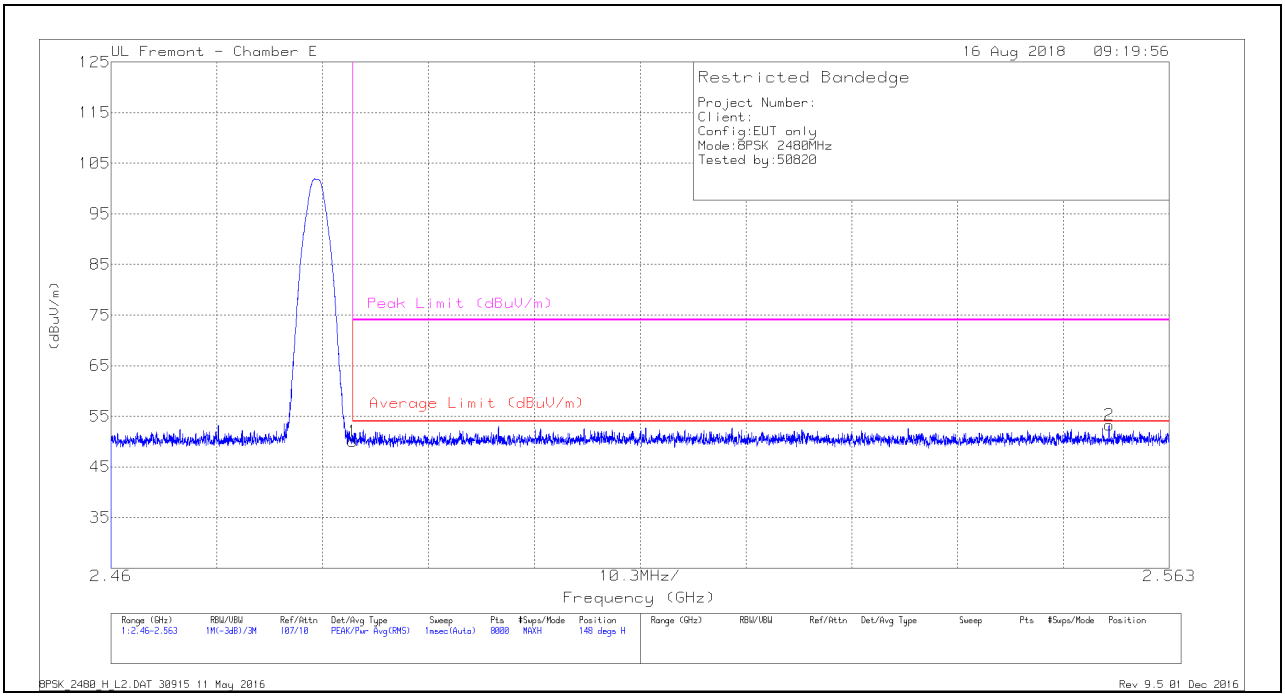


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.17	Pk	32	-22.6	50.57	74	-23.43	45	379	V
2	* 2.332	43.86	Pk	31.8	-22.7	52.96	74	-21.04	45	379	V

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

BANDEDGE (HIGH CHANNEL)

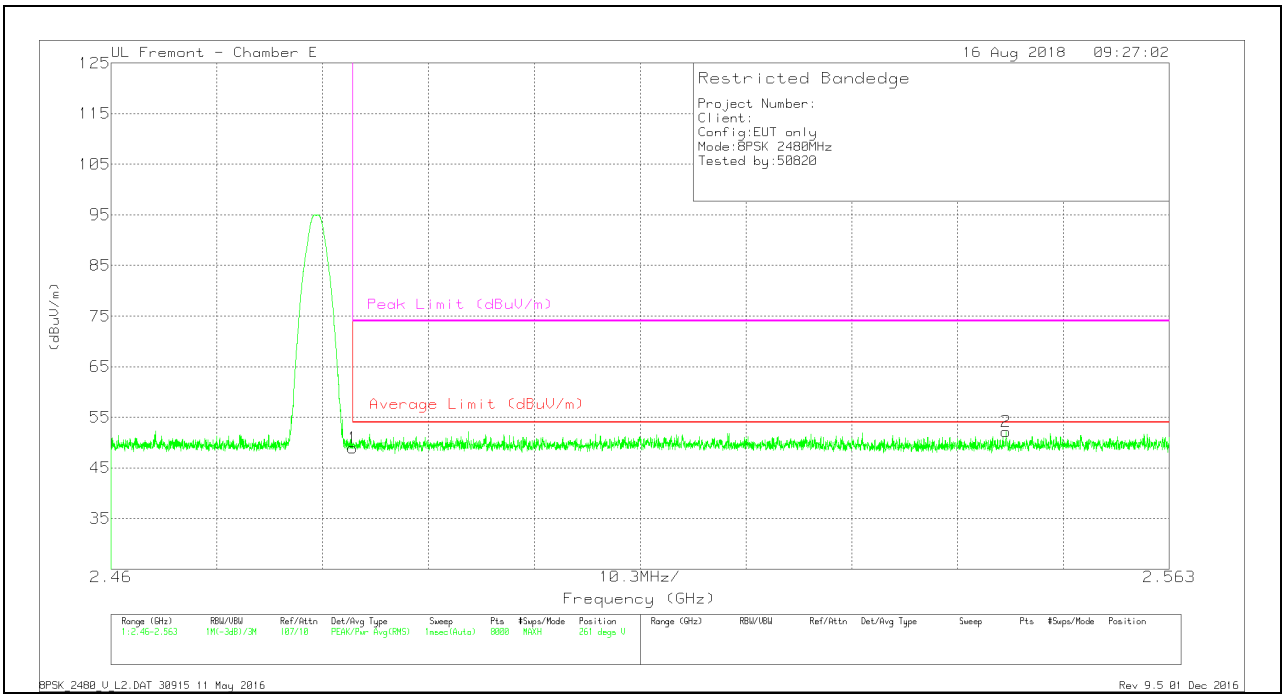
HORIZONTAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.24	Pk	32.1	-22.3	50.04	74	-23.96	148	110	H
2	2.557	43.52	Pk	32.1	-22.3	53.32	74	-20.68	148	110	H

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

VERTICAL RESULT

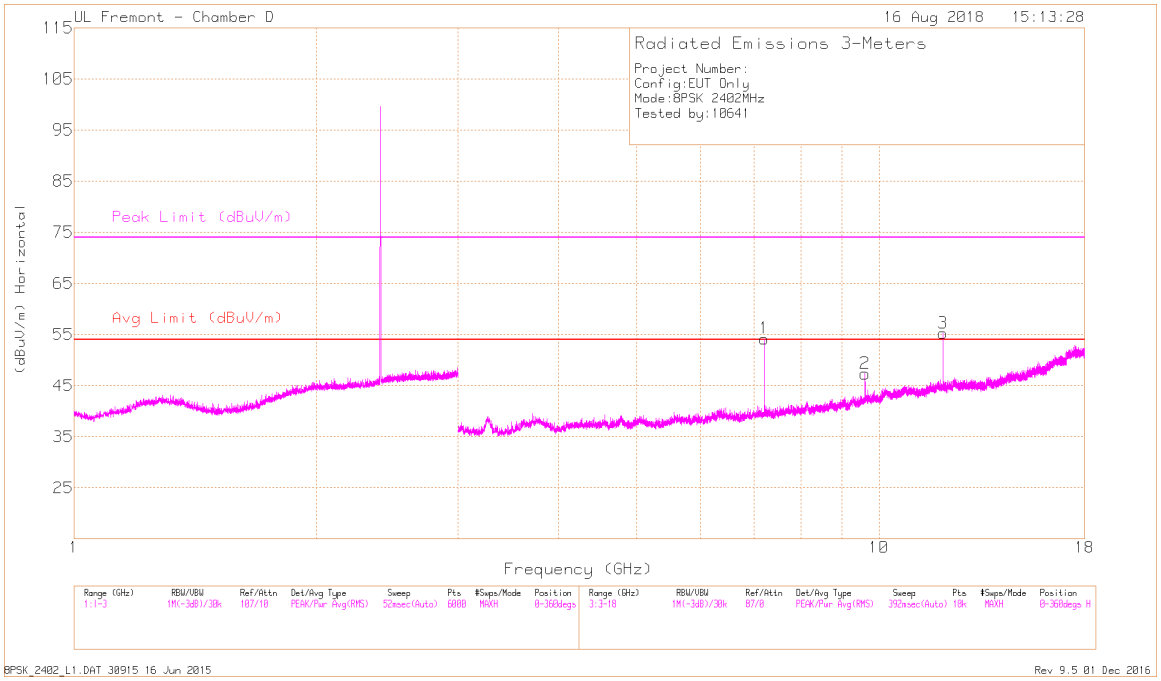


Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.11	Pk	32.1	-22.3	48.91	74	-25.09	261	310	V
2	2.547	42.34	Pk	32.1	-22.3	52.14	74	-21.86	261	310	V

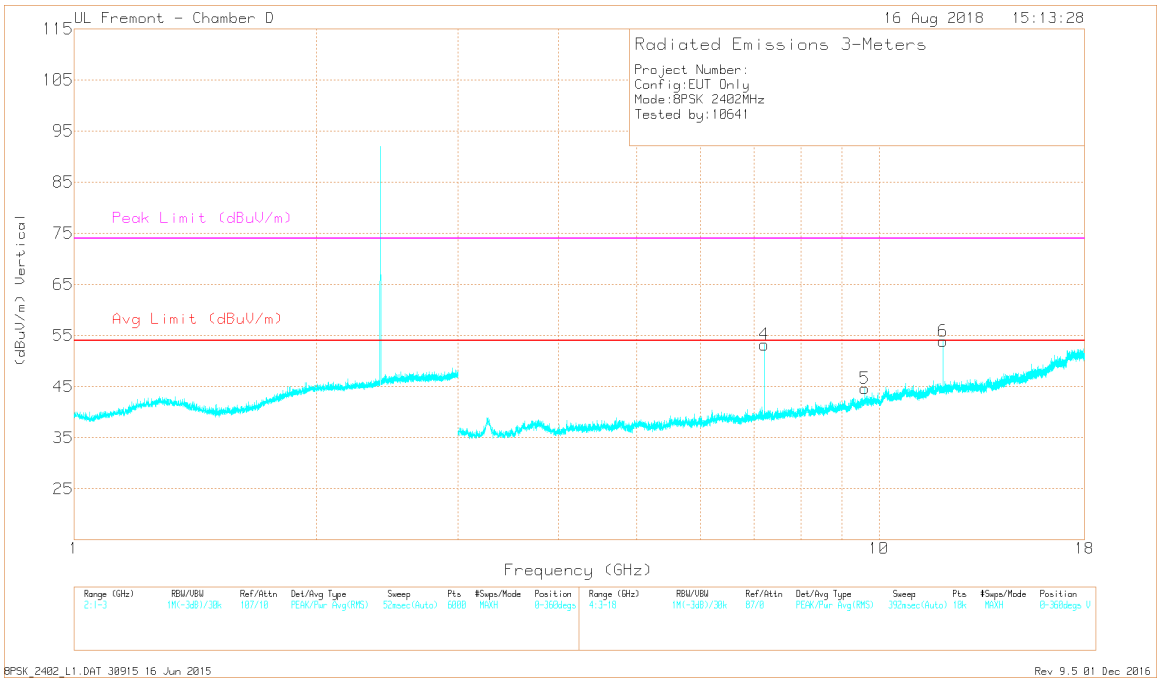
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

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RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 12.01	39.9	PKFH	39.1	-20.5	58.5	74	-15.5	96	141	H
6	* 12.011	40.98	PKFH	39.1	-20.5	59.58	74	-14.42	349	124	V
1	7.207	45.45	PKFH	35.6	-24.6	56.45	-	-	231	128	H
4	7.206	45.93	PKFH	35.6	-24.6	56.93	-	-	330	314	V
5	9.605	32.55	PKFH	36.9	-20.7	48.75	-	-	76	103	V
2	9.609	38.21	PKFH	36.9	-20.8	54.31	-	-	244	104	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RBW=1MHz VBW=3 x RBW, Peak

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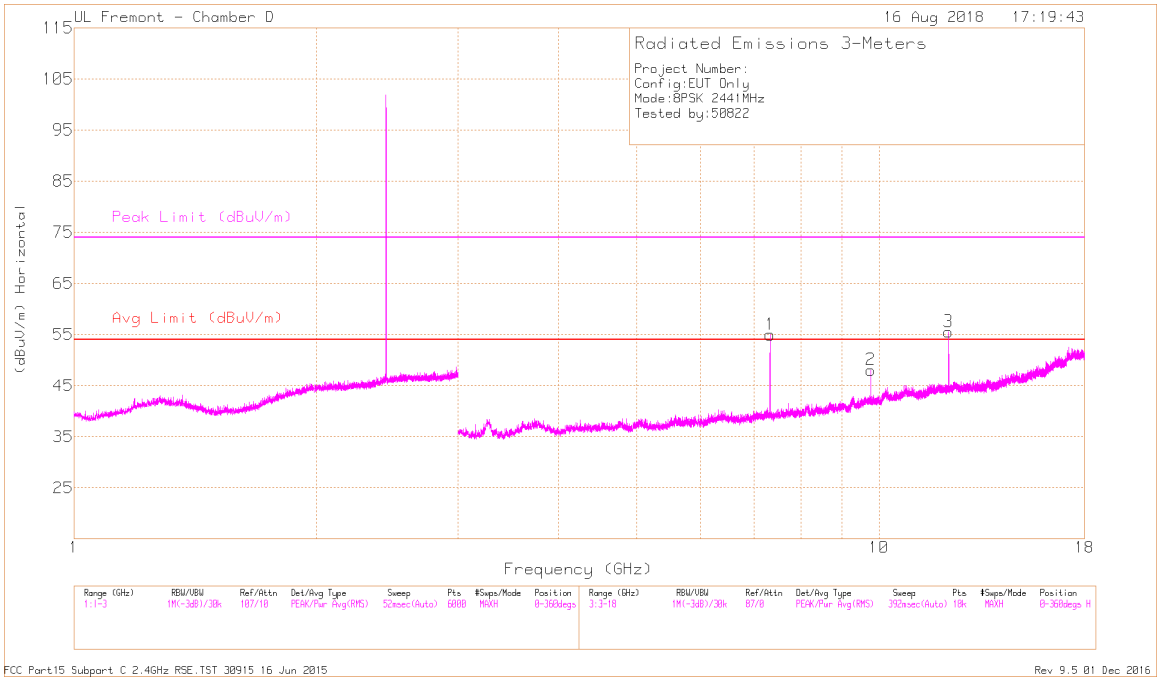
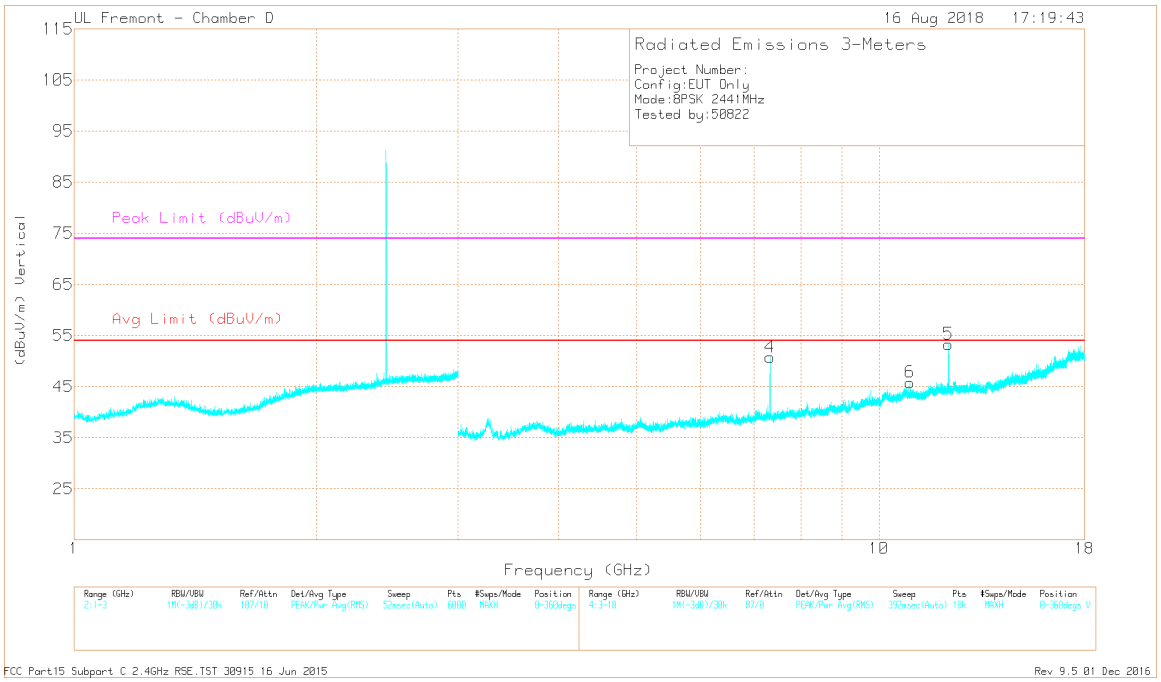
MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 7.323	47.17	PKFH	35.8	-24.6	58.37	74	-15.63	261	103	H
3	* 12.204	41.22	PKFH	39	-20.1	60.12	74	-13.88	102	120	H
4	* 7.322	45.74	PKFH	35.8	-24.6	56.94	74	-17.06	330	233	V
5	* 12.204	39.62	PKFH	39	-20.1	58.52	74	-15.48	4	102	V
6	* 10.918	31.64	PKFH	38.1	-20.2	49.54	74	-24.46	246	108	V
2	9.765	36.99	PKFH	37.1	-21.3	52.79	-	-	267	107	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RBW=1MHz VBW=3 x RBW, Peak

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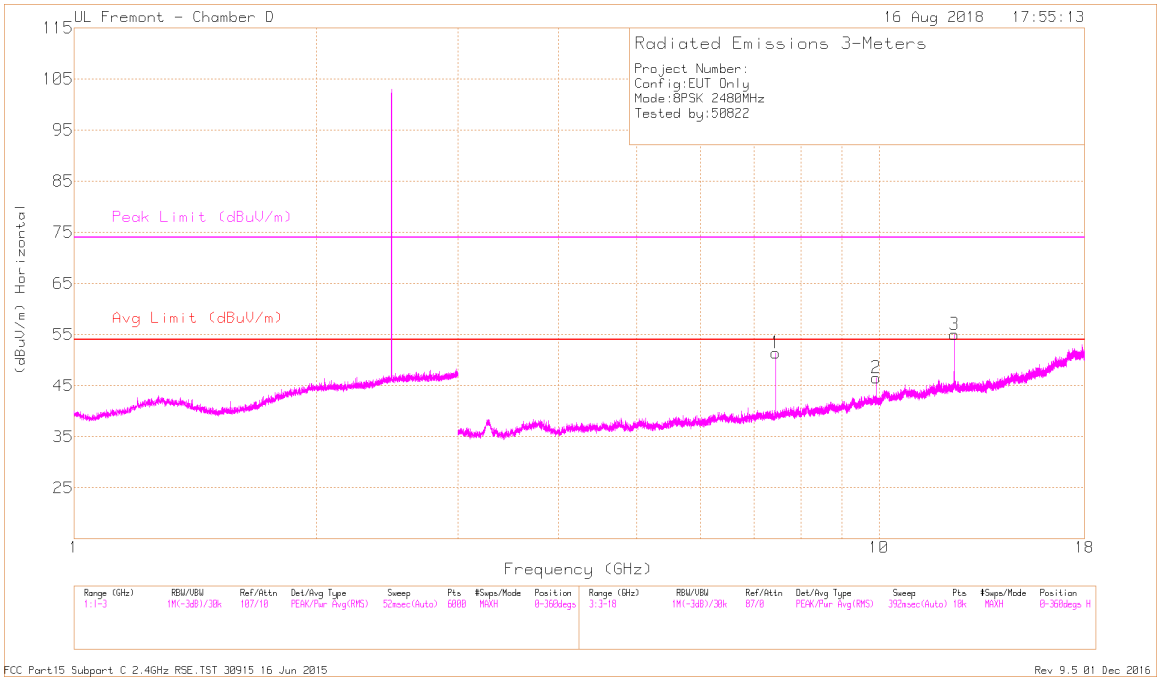
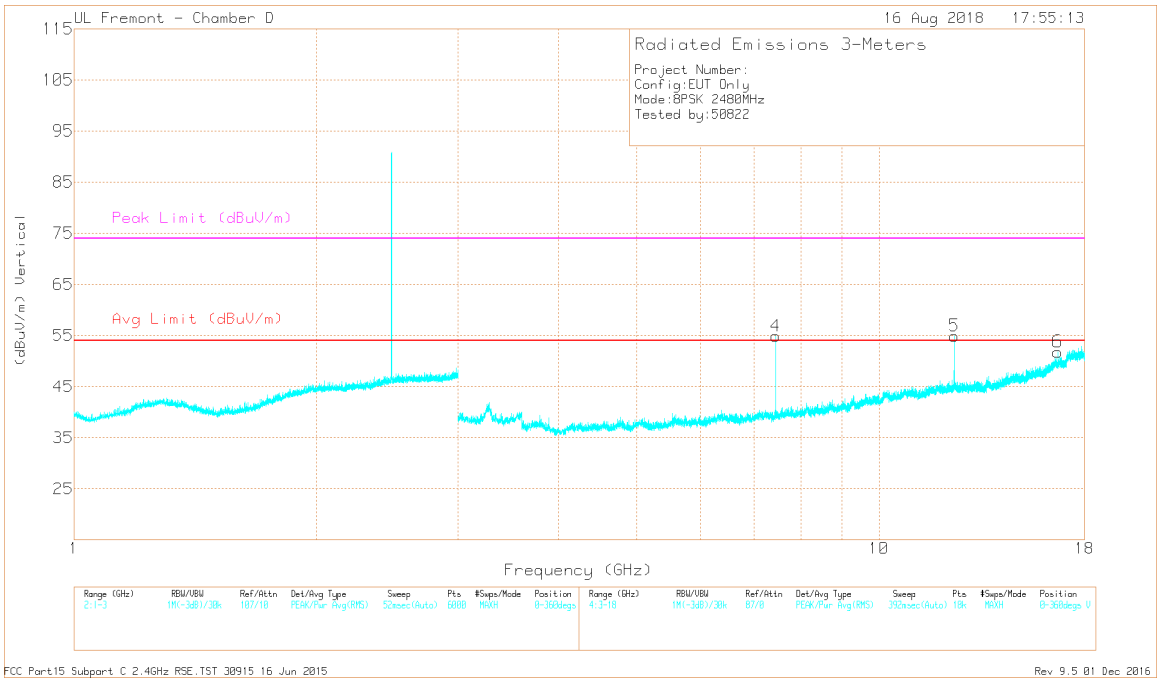
HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 7.439	44.77	PKFH	35.9	-24	56.67	74	-17.33	160	101	H
3	* 12.401	40.88	PKFH	39.1	-19.7	60.28	74	-13.72	262	103	H
4	* 7.44	43.02	PKFH	35.9	-24	54.92	74	-19.08	202	283	V
5	* 12.399	40.75	PKFH	39	-19.7	60.05	74	-13.95	245	199	V
2	9.92	35.41	PKFH	37	-20.1	52.31	-	-	168	111	H
6	16.673	31.97	PKFH	41.4	-17.7	55.67	-	-	278	115	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH - FHSS: RBW=1MHz VBW=3 x RBW, Peak

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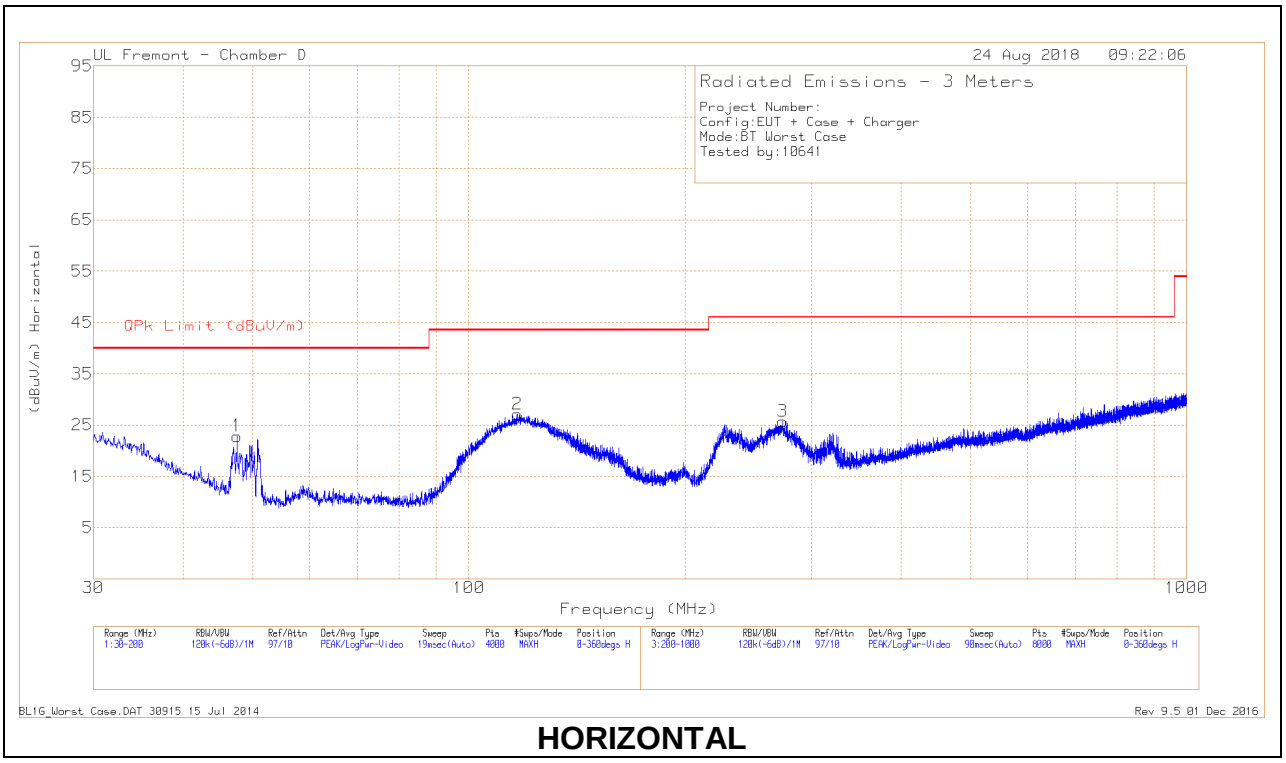
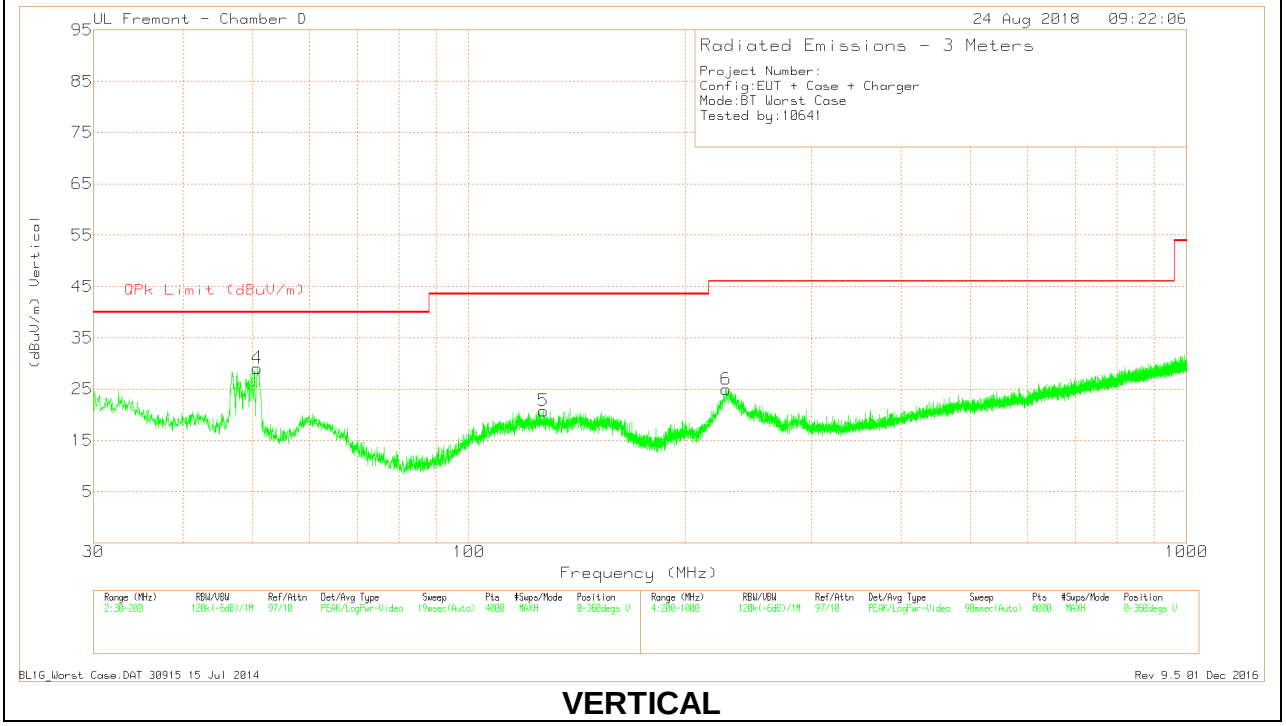
9.2. Worst Case Below 1 GHz

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



HORIZONTAL



VERTICAL

Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T477 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 116.9775	38.58	Pk	19.4	-30.9	27.08	43.52	-16.44	0-360	199	H
5	* 127.0951	31.84	Pk	19.7	-30.8	20.74	43.52	-22.78	0-360	100	V
3	* 273.6096	36.25	Pk	19.2	-29.7	25.75	46.02	-20.27	0-360	101	H
1	47.557	39.57	Pk	14.8	-31.5	22.87	40	-17.13	0-360	399	H
4	50.7029	46.99	Pk	13.6	-31.5	29.09	40	-10.91	0-360	100	V
6	228.4037	38.16	Pk	16.8	-30	24.96	46.02	-21.06	0-360	101	V

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

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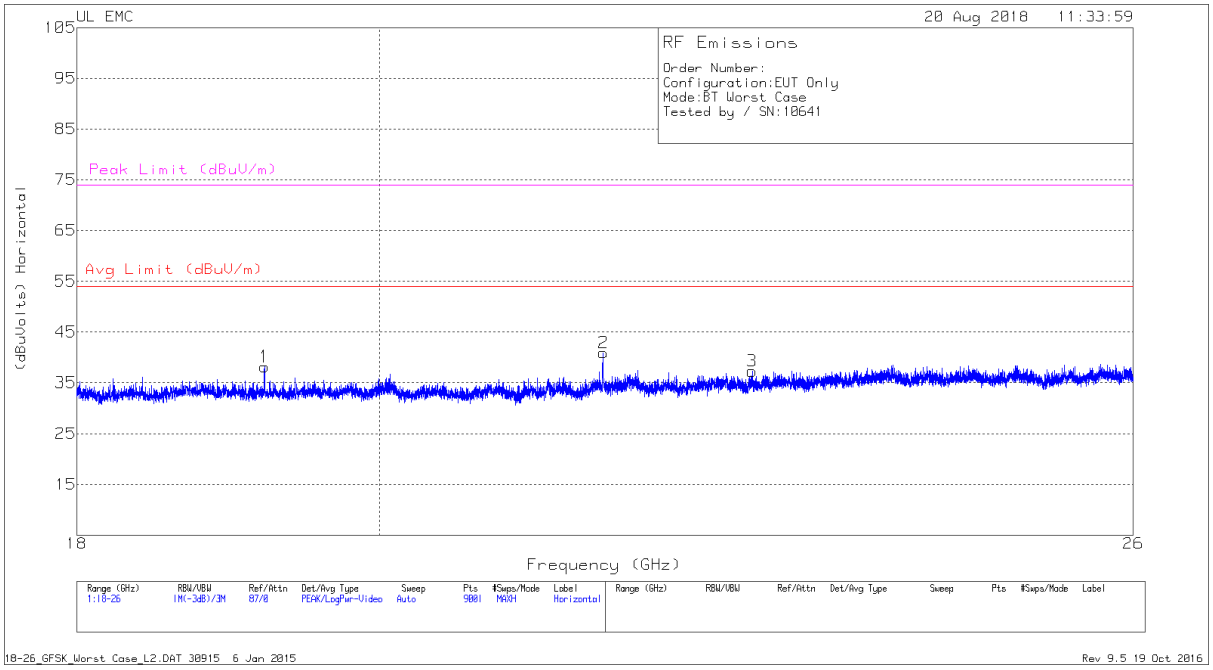
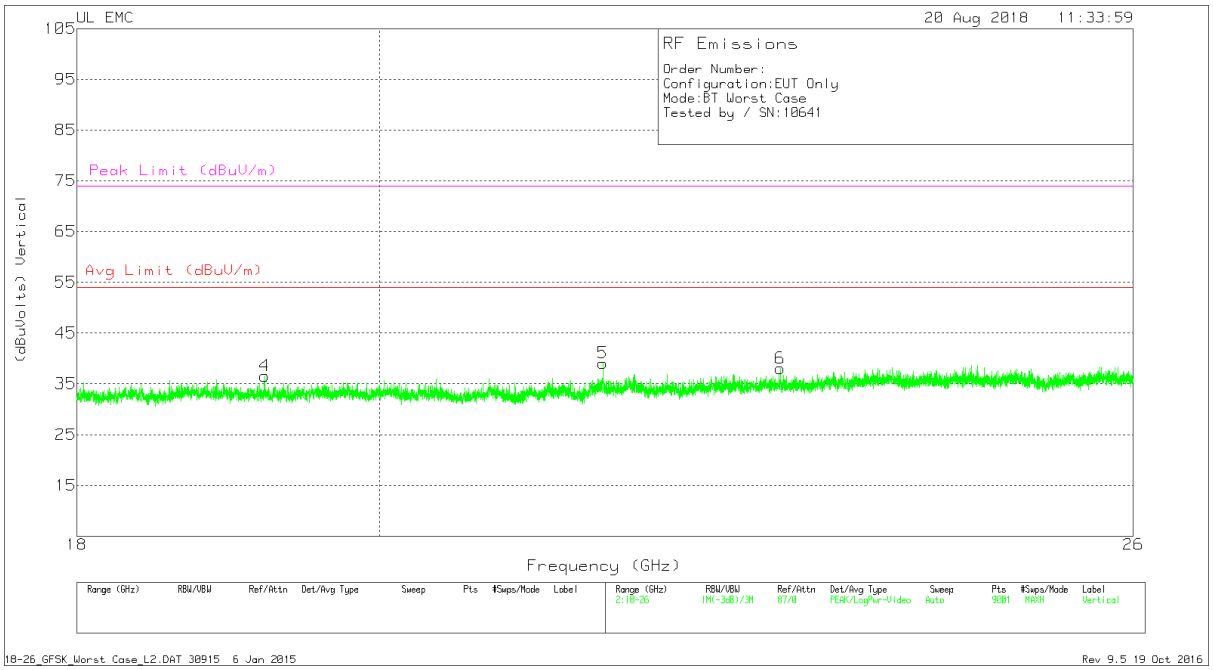
9.3. Worst Case 18-26 GHz

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



HORIZONTAL



VERTICAL

18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)
1	19.215	40.24	Pk	32.3	-24.9	-9.5	38.14	54	-15.86	74	-35.86
2	21.62	42.42	Pk	33.2	-25.2	-9.5	40.92			74	-33.08
	21.617	28	Av	33.2	-25.2	-9.5	26.5	54	-27.5		
3	22.77	38.19	Pk	33.2	-24.6	-9.5	37.29	54	-16.71	74	-36.71
4	19.217	38.66	Pk	32.3	-24.9	-9.5	36.56	54	-17.44	74	-37.44
5	21.616	40.56	Pk	33.2	-25.2	-9.5	39.06			74	-34.94
	21.62	26.08	Av	33.2	-25.2	-9.5	24.58	54			
6	22.994	38.94	Pk	33.5	-24.9	-9.5	38.04	54	-15.96	74	-35.96

Pk - Peak detector

Av - Average detection

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10. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

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

UL VERIFICATION SERVICES INC.
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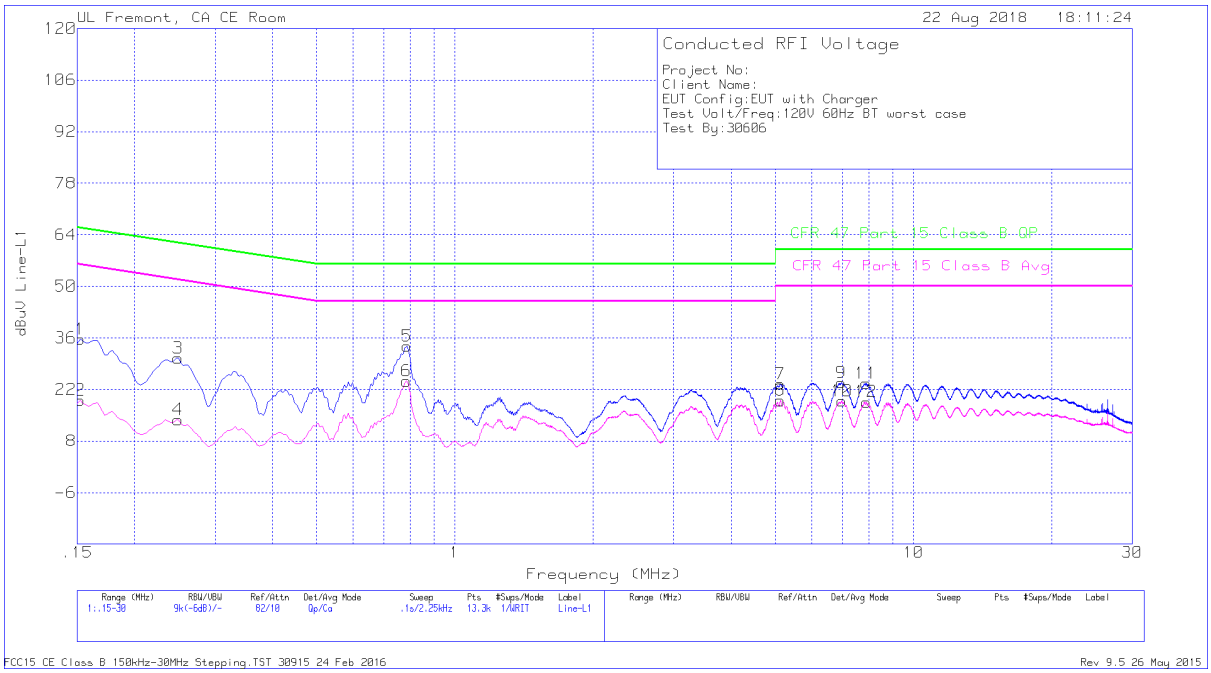
10.1. EUT POWERED BY AC/DC ADAPTER VIA USB CABLE

LINE 1 RESULTS

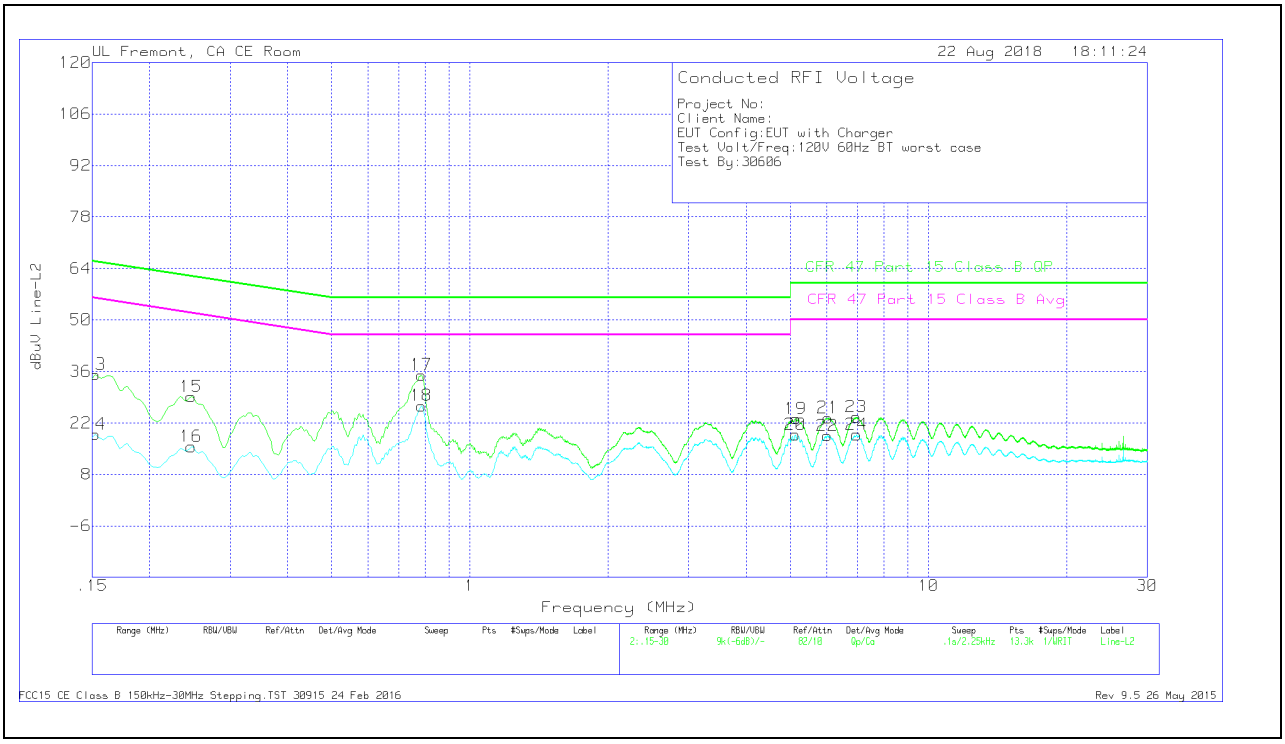


Range 1: Line-L1 .15 - 30MHz

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	.15225	25.41	Qp	.1	0	10.1	35.61	65.88	-30.27	-	-
2	.15225	8.88	Ca	.1	0	10.1	19.08	-	-	55.88	-36.8
3	.249	20.42	Qp	0	0	10.1	30.52	61.79	-31.27	-	-
4	.249	3.68	Ca	0	0	10.1	13.78	-	-	51.79	-38.01
5	.78675	23.62	Qp	0	0	10.1	33.72	56	-22.28	-	-
6	.7845	14.18	Ca	0	0	10.1	24.28	-	-	46	-21.72
7	5.13038	13.29	Qp	0	.1	10.1	23.49	60	-36.51	-	-
8	5.12925	8.78	Ca	0	.1	10.1	18.98	-	-	50	-31.02
9	6.96188	13.43	Qp	0	.2	10.2	23.83	60	-36.17	-	-
10	6.9765	8.48	Ca	0	.2	10.2	18.88	-	-	50	-31.12
11	7.881	13.26	Qp	0	.2	10.2	23.66	60	-36.34	-	-
12	7.8855	8.22	Ca	0	.2	10.2	18.62	-	-	50	-31.38

Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS



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	.15225	24.95	Qp	.1	0	10.1	35.15	65.88	-30.73	-	-
14	.15225	8.73	Ca	.1	0	10.1	18.93	-	-	55.88	-36.95
15	.24675	19.05	Qp	0	0	10.1	29.15	61.87	-32.72	-	-
16	.24675	5.45	Ca	0	0	10.1	15.55	-	-	51.87	-36.32
17	.7845	24.92	Qp	0	0	10.1	35.02	56	-20.98	-	-
18	.7845	16.55	Ca	0	0	10.1	26.65	-	-	46	-19.35
19	5.13488	12.96	Qp	0	.1	10.1	23.16	60	-36.84	-	-
20	5.127	8.6	Ca	0	.1	10.1	18.8	-	-	50	-31.2
21	6.03825	12.98	Qp	0	.2	10.2	23.38	60	-36.62	-	-
22	6.018	8.14	Ca	0	.2	10.2	18.54	-	-	50	-31.46
23	6.9585	13.19	Qp	0	.2	10.2	23.59	60	-36.41	-	-
24	6.96975	8.4	Ca	0	.2	10.2	18.8	-	-	50	-31.2

Qp - Quasi-Peak detector

Ca - CISPR average detection

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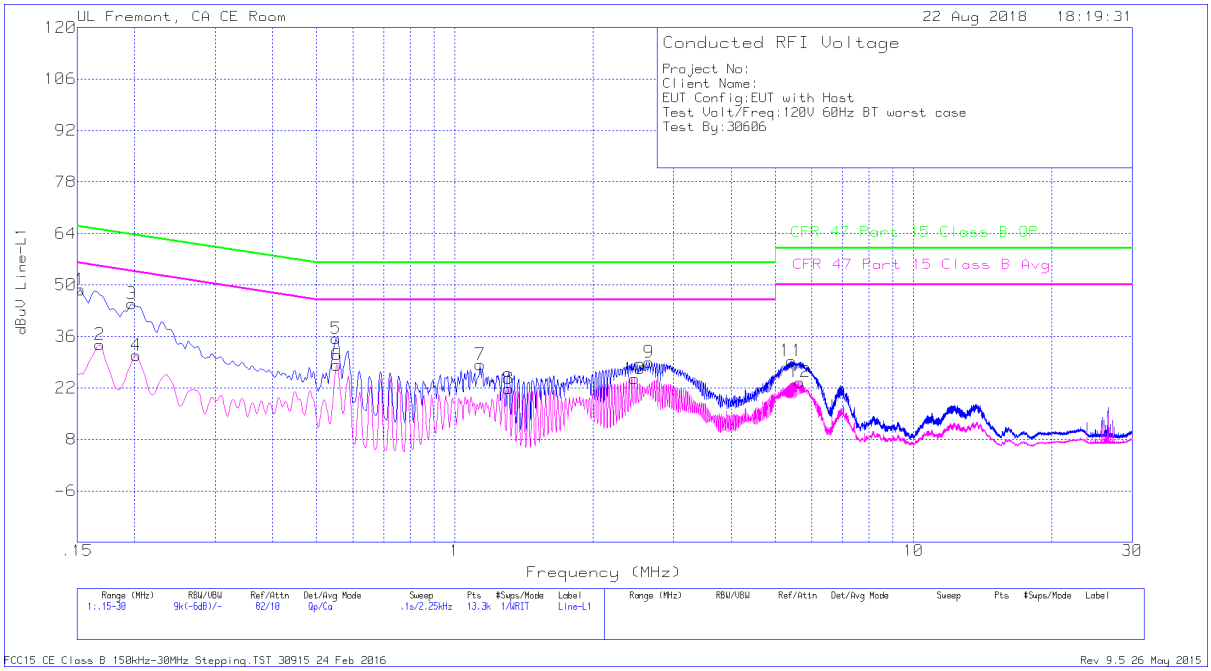
10.2. EUT POWERED BY HOST PC VIA USB CABLE

LINE 1 RESULTS

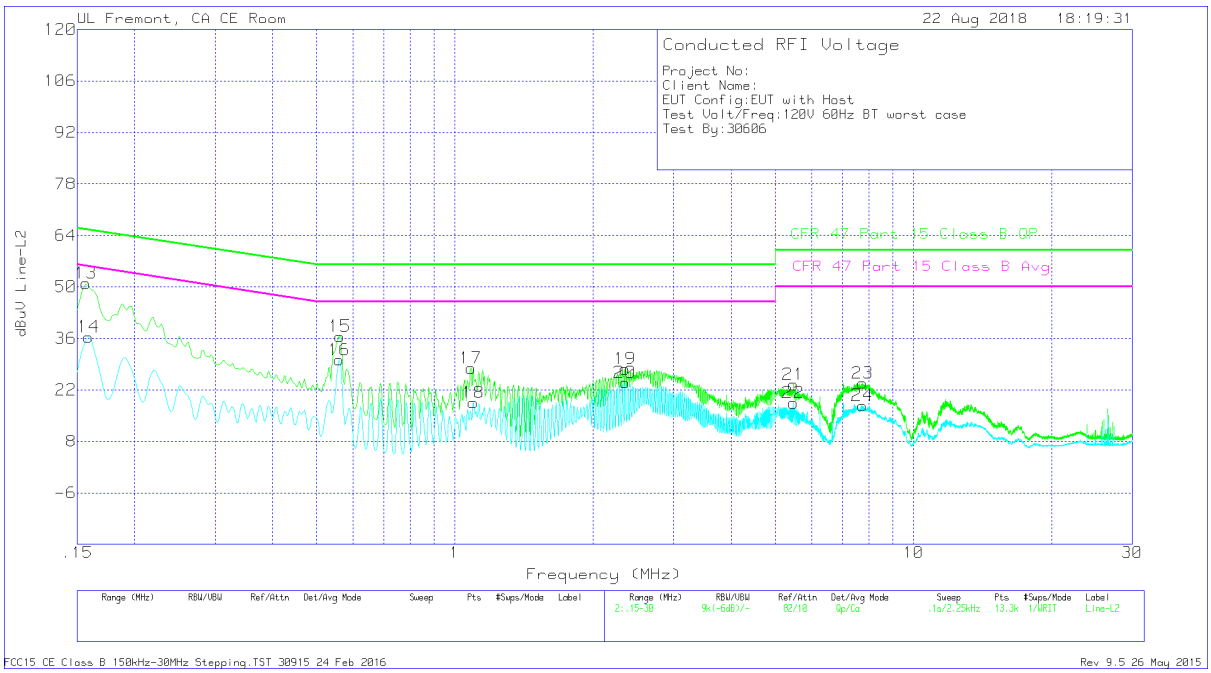


Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN L1	LC Cables C1&C3	Limiter (dB)	Corrected Reading dBuV	CFR 47 Part 15 Class B QP	QP Margin (dB)	CFR 47 Part 15 Class B Avg	Av(CISPR)Margin (dB)
1	.15225	38.54	Qp	.1	0	10.1	48.74	65.88	-17.14	-	-
2	.168	23.59	Ca	.1	0	10.1	33.79	-	-	55.06	-21.27
3	.19725	34.8	Qp	0	0	10.1	44.9	63.73	-18.83	-	-
4	.20175	20.77	Ca	0	0	10.1	30.87	-	-	53.54	-22.67
5	.5505	25.36	Qp	0	0	10.1	35.46	56	-20.54	-	-
6	.55275	18.12	Ca	0	0	10.1	28.22	-	-	46	-17.78
7	1.1355	18.11	Qp	0	.1	10.1	28.31	56	-27.69	-	-
8	1.30875	11.64	Ca	0	.1	10.1	21.84	-	-	46	-24.16
9	2.652	18.81	Qp	0	.1	10.1	29.01	56	-26.99	-	-
10	2.463	14.34	Ca	0	.1	10.1	24.54	-	-	46	-21.46
11	5.41725	19.15	Qp	0	.1	10.1	29.35	60	-30.65	-	-
12	5.649	13.18	Ca	0	.2	10.2	23.58	-	-	50	-26.42

Qp - Quasi-Peak detector

Ca - CISPR average detection

LINE 2 RESULTS



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	.15675	40.76	Qp	.1	0	10.1	50.96	65.63	-14.67	-	-
14	.159	26.19	Ca	.1	0	10.1	36.39	-	-	55.52	-19.13
15	.56175	26.42	Qp	0	0	10.1	36.52	56	-19.48	-	-
16	.5595	20.07	Ca	0	0	10.1	30.17	-	-	46	-15.83
17	1.08375	17.67	Qp	0	.1	10.1	27.87	56	-28.13	-	-
18	1.09725	8.31	Ca	0	.1	10.1	18.51	-	-	46	-27.49
19	2.3505	17.51	Qp	0	.1	10.1	27.71	56	-28.29	-	-
20	2.34825	13.77	Ca	0	.1	10.1	23.97	-	-	46	-22.03
21	5.47125	13.24	Qp	0	.1	10.1	23.44	60	-36.56	-	-
22	5.47125	8.27	Ca	0	.1	10.1	18.47	-	-	50	-31.53
23	7.746	13.41	Qp	0	.2	10.2	23.81	60	-36.19	-	-
24	7.73925	7.34	Ca	0	.2	10.2	17.74	-	-	50	-32.26

Qp - Quasi-Peak detector

Ca - CISPR average detection

END OF REPORT

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11. SETUP PHOTOS

Please refer to 12458150-E1V1 Setup_Photos for setup photos

END OF REPORT

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