



TEST REPORT

Report Number. : 13268681-E1V2

Applicant : SONOS INC.
614 CHAPALA STREET
SANTA BARBARA, CA, 93101, U.S.A

Model : S27

FCC ID : SBVRM027

ISED : 5373A-RM027

EUT Description : 802.11 a/b/g/n/ac 2x2 Client Device with BT and BLE

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
ISED RSS-247 ISSUE 2
ISED RSS-GEN ISSUE 5

Date Of Issue:

January 22, 2021

Prepared by:

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NVLAP Lab code: 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	12/18/2020	Initial Issue	
V2	1/22/2021	Updated Section 3, 8,11 & 12 Added BT and BLE to EUT Description, Section 10 added statement, Updated Section 4.	Kiya Kedida

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SONOS INC.
614 CHAPALA STREET
SANTA BARBARA, CA 93101, U.S.A.

EUT DESCRIPTION: 802.11 a/b/g/n/ac 2x2 Client Device with BT and BLE

MODEL: S27

SERIAL NUMBER: A1002009W54-2A-1B-40-06-6E3 (Radiated Sample)
A1002009W54-2A-1B-B0-02-94D (Radiated Sample)
5CFFDD0001067 (Conducted Sample)

DATE TESTED: November 04 to November 18, 2020

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.

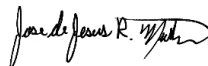
This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This 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
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2. TEST RESULTS SUMMARY

FCC Clause	ISED Clause	Requirement	Result	Comment
See Comment		Duty Cycle	Reporting purposes only	Per ANSI C63.10, Section 11.6.
See Comment	RSS-GEN 6.7	20dB BW/99% OBW	Reporting purposes only	ANSI C63.10 Sections 6.9.2 and 6.9.3
15.247 (a)(1)	RSS-247 (5.1) (b)	Hopping Frequency Separation		None.
15.247 (a)(1)(iii)	RSS-247 (5.1) (d)	Number of Hopping Channels		None.
15.247 (a)(1)(iii)	RSS-247 (5.1) (d)	Average Time of Occupancy		None.
15.247 (b)(1)	RSS-247 (5.4) (b)	Output Power		None.
See Comment		Average Power	Reporting purposes only	Per ANSI C63.10, Section 11.9.2.3.2.
15.247 (d)	RSS-247 (5.5)	Conducted Spurious Emissions		None.
15.209, 15.205	RSS-GEN 8.9, 8.10	Radiated Emissions		None.
15.207	RSS-Gen 8.8	AC Mains Conducted Emissions		None.

3. 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 v05r02, KDB 414788 D01 Radiated Test Site v01r01, RSS-GEN Issue 5, and RSS-247 Issue 2.

4. FACILITIES AND ACCREDITATION

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input checked="" type="checkbox"/>	Building 1: 47173 Benicia Street, Fremont, California 94538, USA	US0104	2324A	208313
<input type="checkbox"/>	Building 2: 47266 Benicia Street, Fremont, California 94538, USA	US0104	22541	208313
<input checked="" type="checkbox"/>	Building 4: 47658 Kato Rd, Fremont, California 94538, USA	US0104	2324B	208313

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

5.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

5.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U _{Lab}
Worst Case Conducted Disturbance, 9KHz to 0.15 MHz	3.78 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.4 dB
Worst Case Radiated Disturbance, 9KHz to 30 MHz	2.84 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.84 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.73 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.51 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.29 dB

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

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Field Strength (dBuV/m)} = \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} - \text{Preamp Gain (dB)}$$

$$36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\text{Final Voltage (dBuV)} = \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \text{LISN Insertion Loss.}$$

$$36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$$

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is a 802.11 a/b/g/n/ac 2x2 Client Device with BT and BLE .

6.2. 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	12.26	16.83
2402 - 2480	Enhanced DQPSK	12.19	16.56
2402 - 2480	Enhanced 8PSK	12.25	16.79

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.

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an PCB antenna, with a maximum gain of 0.8dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was V13.0.

The test utility software used during testing was QRCT v3.0.264.0.

6.5. 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 5 Configurations, it was determined that Configurations 4 was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Configurations 4 orientation.

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

GFSK mode: DH5
8PSK mode: 3-DH5

6.6. DESCRIPTION OF TEST SETUP

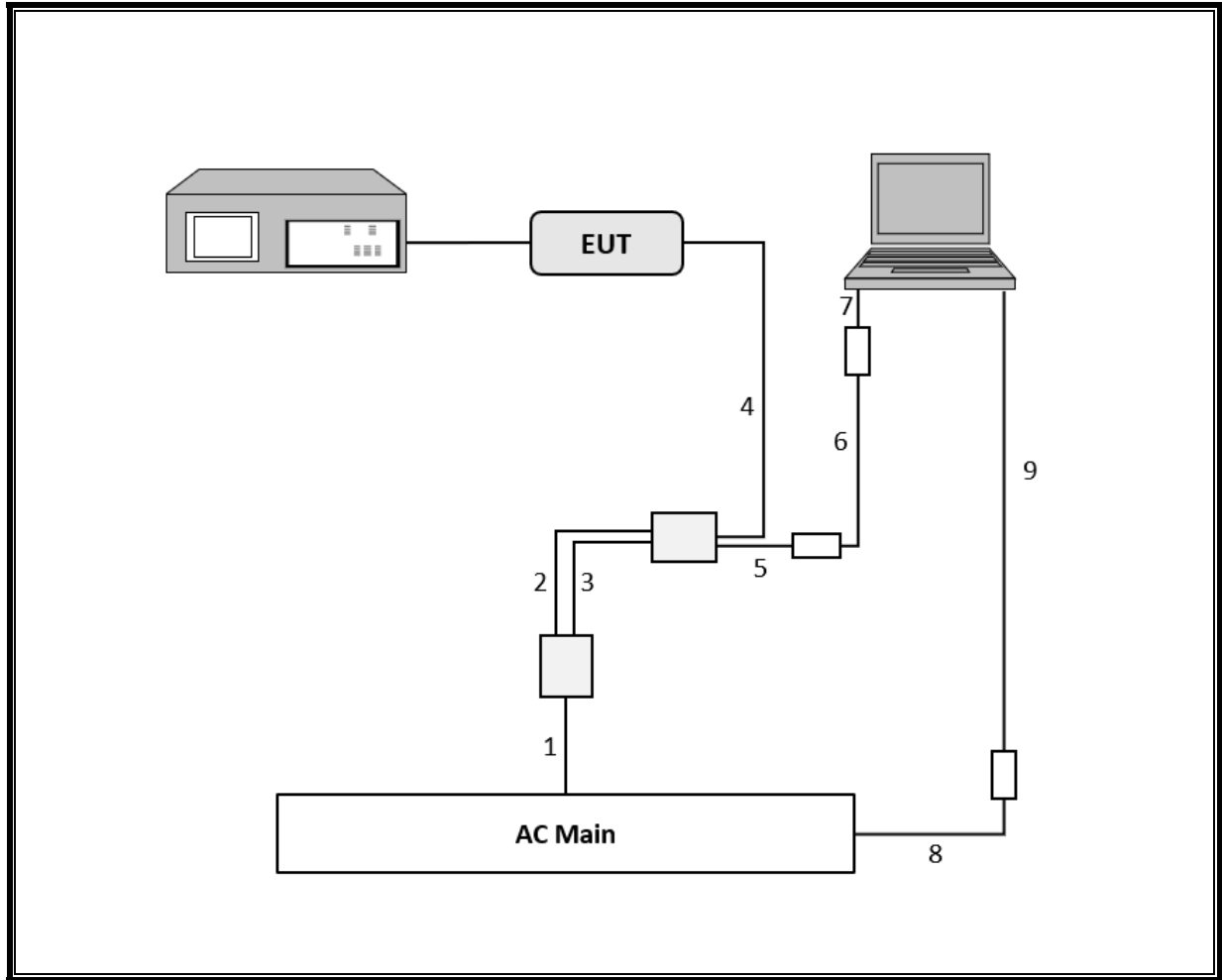
SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Lenovo	X1 Carbon	R90HKAXY	N/A
AC Adaptor	Lenovo	ADLX45NCC2A	8SSA10E75794C1SG78H7210	N/A
Type-C Power Adapter	IIIP	PDS75-4UT01	N/A	N/A

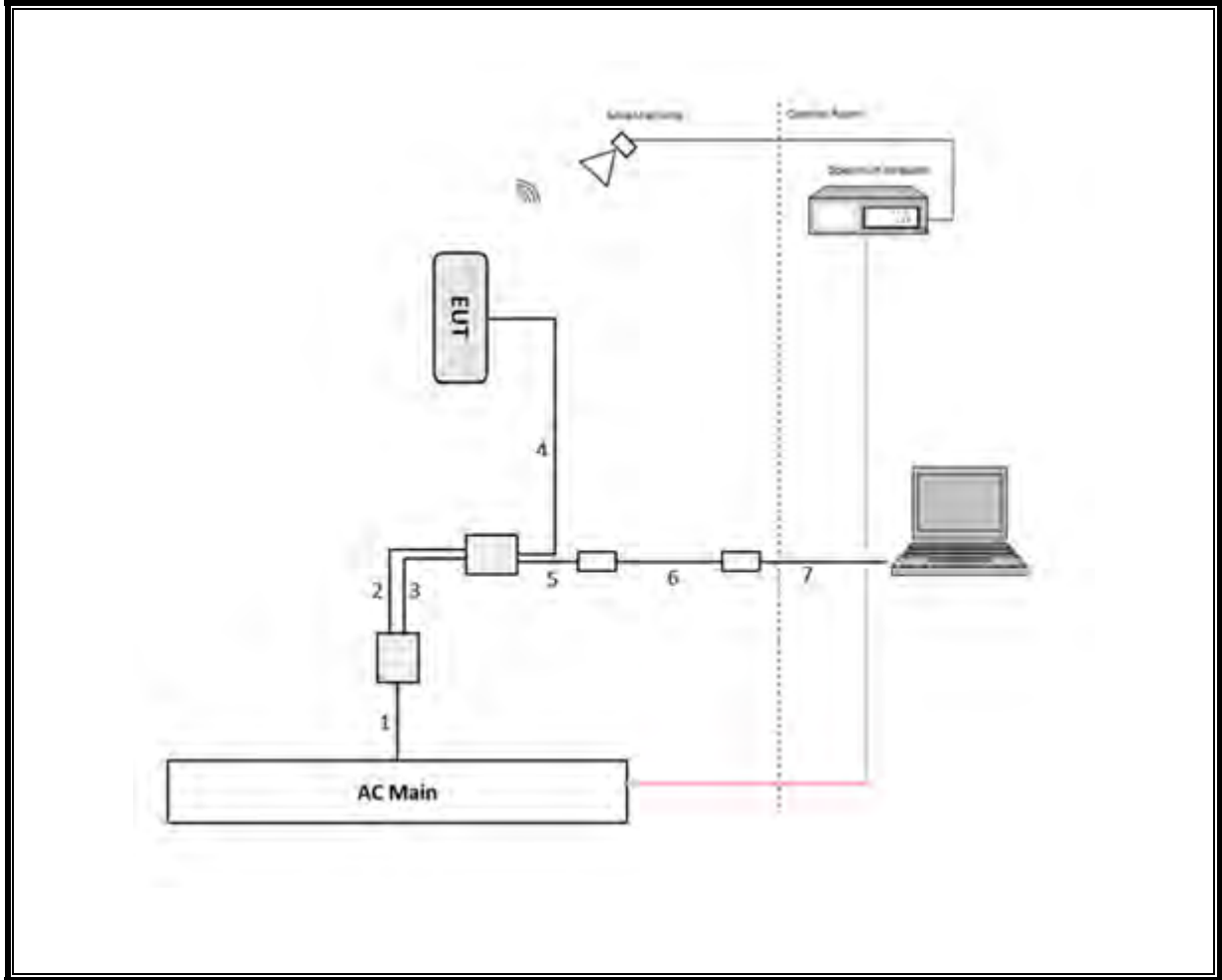
I/O CABLES

Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC Adapter	1	AC	Unshielded	1m	AC Mains to Power Adapter
2	Type-C	2	USB Type-C	Unshielded	2m	Power Adapter to Power-In Splitter
3	Type-A	1	USB Type-A/Mini-USB	Unshielded	2m	Power Adapter to Power-In Splitter
4	Type-C	2	USB Type-C	Unshielded	1.5m	Splitter Output to EUT
5	Ethernet Adapter	1	Type-A to RJ45	Unshielded	0.2m	Splitter Output to Ethernet Adapter
6	Ethernet	2	RJ45	Unshielded	1m	Ethernet Adapter to Ethernet Adapter
7	Ethernet Adapter	1	RJ45 to Type A	Unshielded	0.3m	Ethernet Adapter to Laptop
8	AC Power	1	AC	Unshielded	1m	AC Mains to Power Adapter
9	DC Power	1	DC	Unshielded	1m	Power Adapter to Laptop

CONDUCTED TEST SETUP DIAGRAM



RADIATED TEST SETUP DIAGRAM



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 Below 30MHz: ANSI C63.10-2013 Section 6.4

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

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

Radiated Band-edge: ANSI C63.10-2013 Section 6.10.5 & 13

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

8. 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	Last Cal
PXA Signal Analyzer 3Hz-44GHz	Agilent Technologies	N9030A	T341	07/29/2021	07/29/2020
Power meter	Keysight	N1911A	T1268	01/22/2021	01/22/2020
Power sensor	Keysight	N1921A	T1223	04/10/2021	04/10/2020
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0203383	02/18/2021	02/18/2020
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T477	09/24/2021	09/24/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	175953	01/23/2021	01/23/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T863	08/31/2021	08/31/2020
Amplifier, 100MHz-18GHz	AMPLICAL	AMP0.1G18-47-20	PRE0197319	05/04/2021	05/04/2020
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO-METRICS	EM-6871	PRE0179465	07/27/2021	07/27/2020
Antenna, Passive Loop 100kHz to 30MHz	ELECTRO-METRICS	EM-6872	PRE0179467	07/27/2021	07/27/2020
Antenna, Horn 18 to 26.5GHz	ARA	MWH-1826/B	T447	09/24/2021	09/24/2020
Rf Amplifier, 18-26.5GHz, 60dB gain	AMPLICAL	AMP18G26.5-60	171590	06/07/2021	06/07/2020
Power Meter, P-series single channel	Keysight Technologies Inc	N1911A	T1264	01/21/2021	01/21/2020
Power Sensor, P - series, 50MHz to 18GHz, Wideband	Keysight Technologies Inc	N1921A	T1223	04/10/2021	04/10/2020
Spectrum Analyzer, PXA, 3Hz to 44GHz	Keysight Technologies Inc	N9030A	T341	07/29/2021	07/29/2020
AC Line Conducted					
EMI Receiver	Rohde & Schwarz	ESR	T1436	02/20/2021	02/20/2020
LISN for Conducted Emissions CISPR-16	Fischer Custom Communications, Inc	FCC-LISN-50/250-25-2-01-480V	PRE0186446	01/21/2021	01/21/2020
Test Software List					
Radiated Software	UL	UL EMC		Ver 9.5, April 30, 2020	
Antenna Port Software	UL	UL RF		Ver 2020.11.8	
AC Line Conducted Software	UL	UL EMC		Ver 9.5, July 7, 2020	

9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

LIMITS

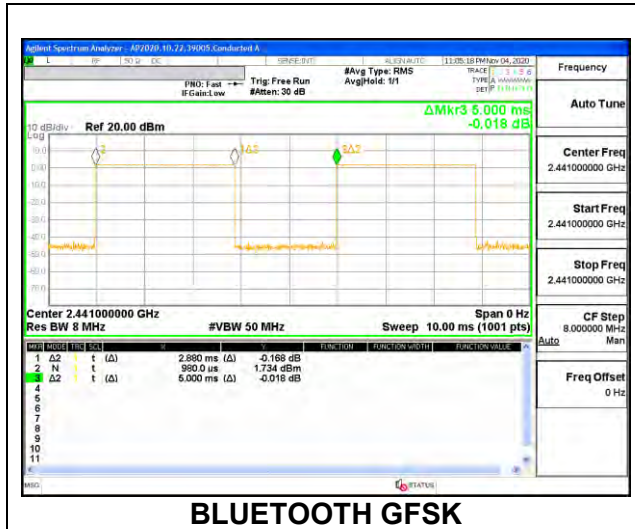
None; for reporting purposes only.

PROCEDURE

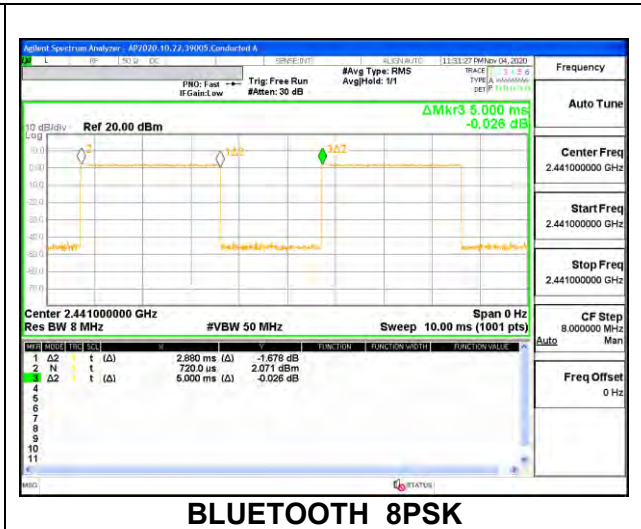
ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

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/T Minimum VBW (kHz)
Bluetooth GFSK	2.88	5.00	0.576	57.6%	2.40	0.347
Bluetooth 8PSK	2.88	5.00	0.576	57.6%	2.40	0.347



BLUETOOTH GFSK



BLUETOOTH 8PSK

9.2. 20 dB AND 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

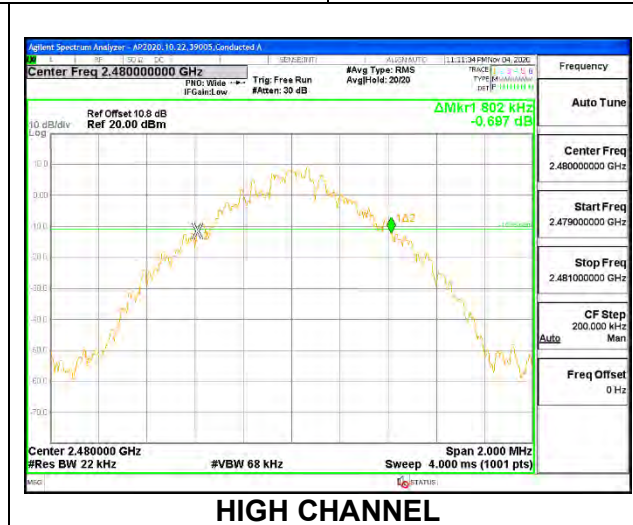
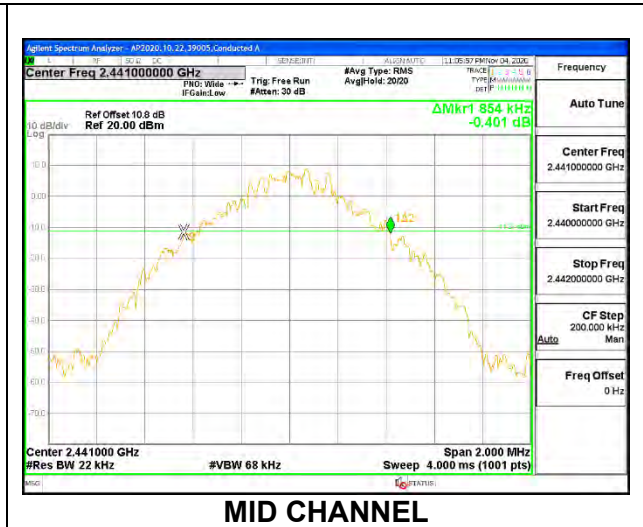
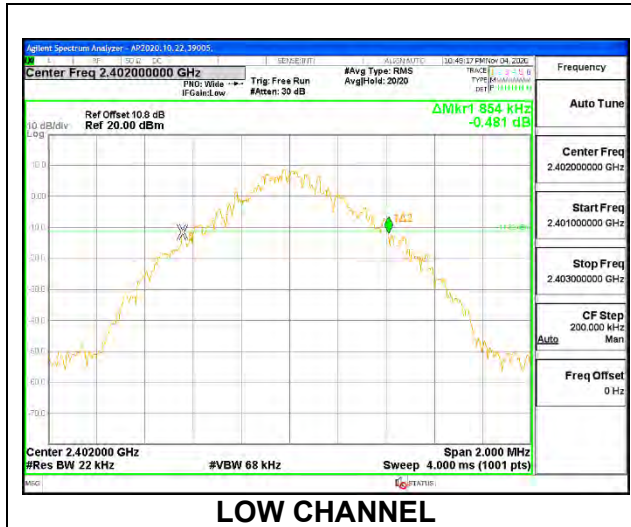
TEST PROCEDURE

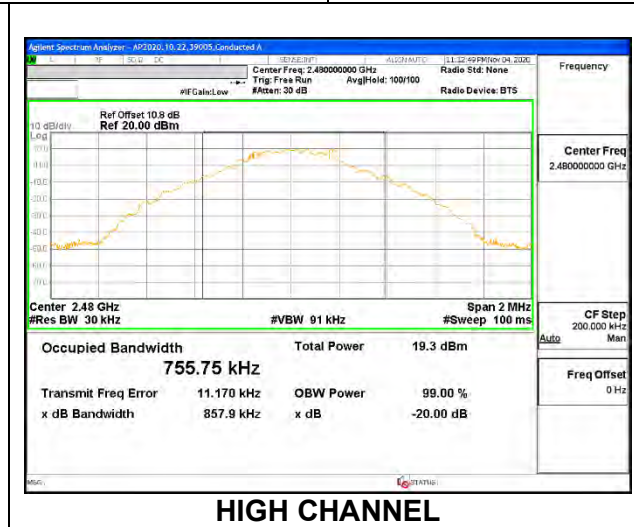
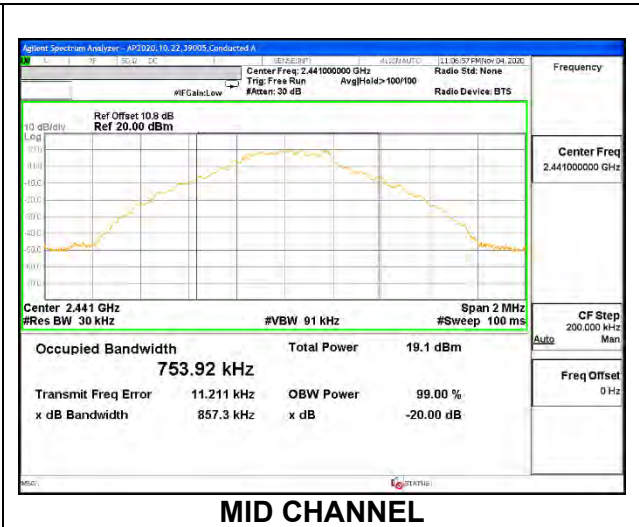
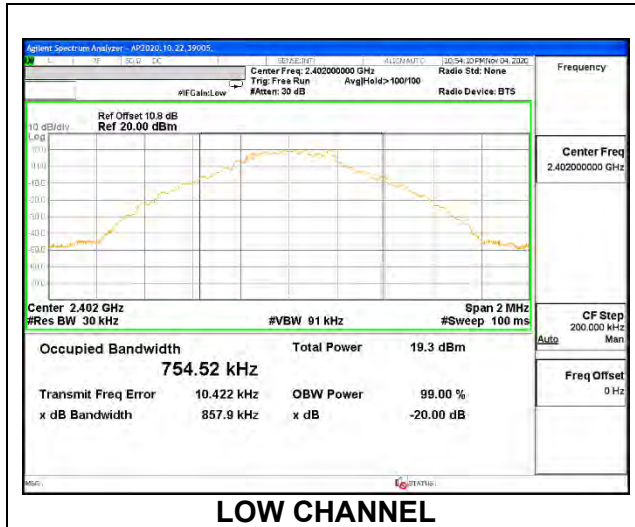
The transmitter output is connected to a spectrum analyzer. The RBW is set to $\geq 1\%$ of the 20 dB bandwidth. The VBW is set to \geq RBW. The sweep time is coupled.

RESULTS

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

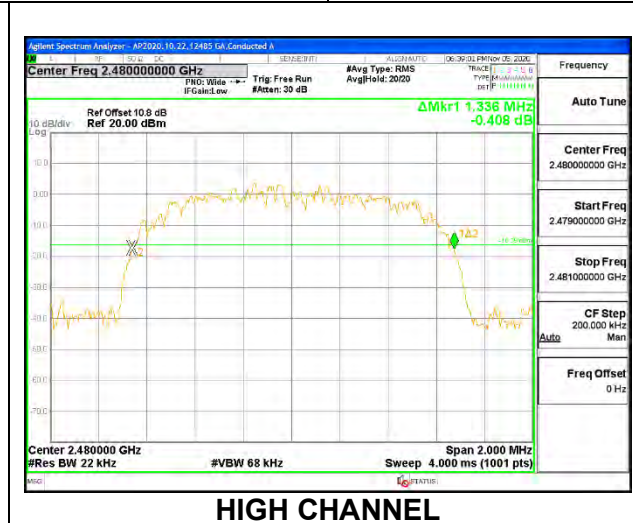
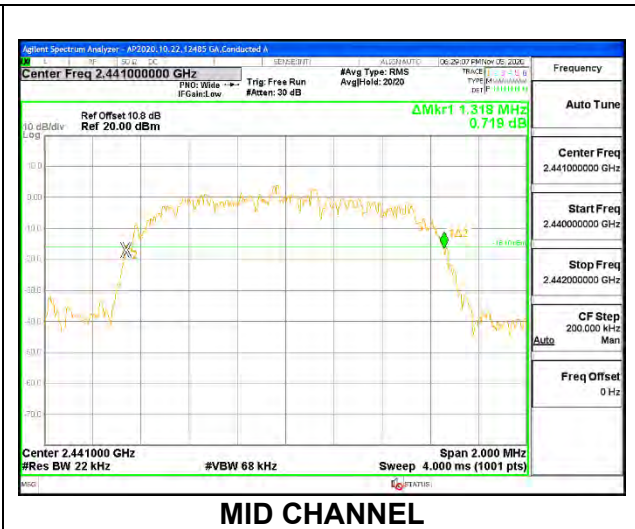
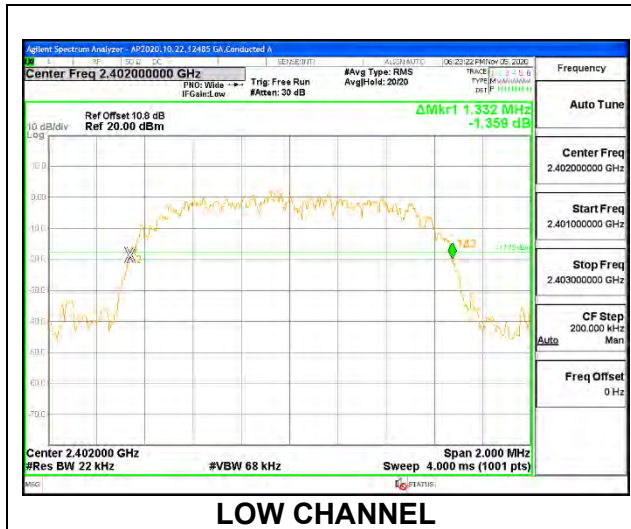
Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	0.854	0.75452
Mid	2441	0.854	0.75392
High	2480	0.802	0.75575

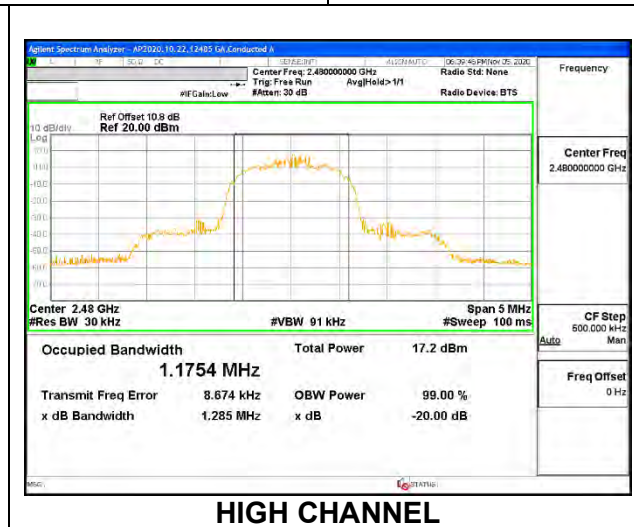
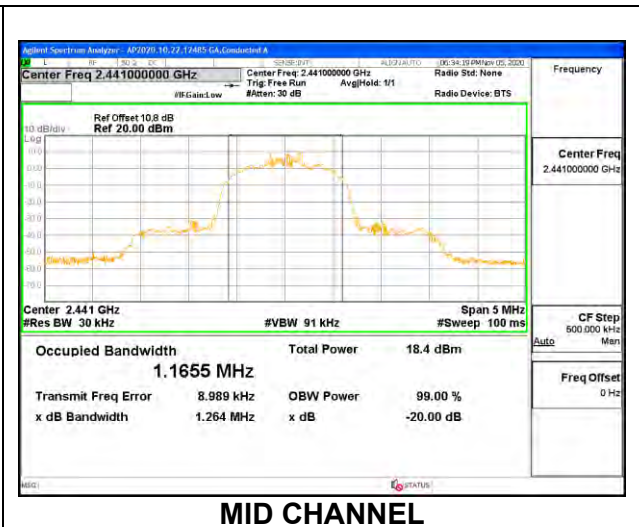
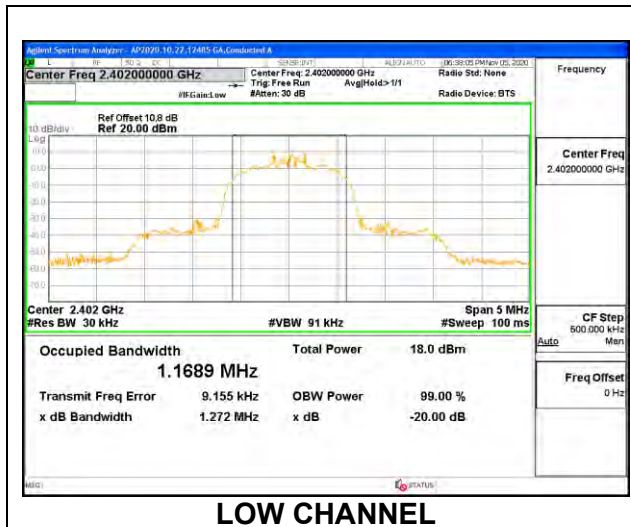




9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	2402	1.332	1.1689
Mid	2441	1.318	1.1655
High	2480	1.336	1.1754





9.3. 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 hopping channel, whichever is greater.

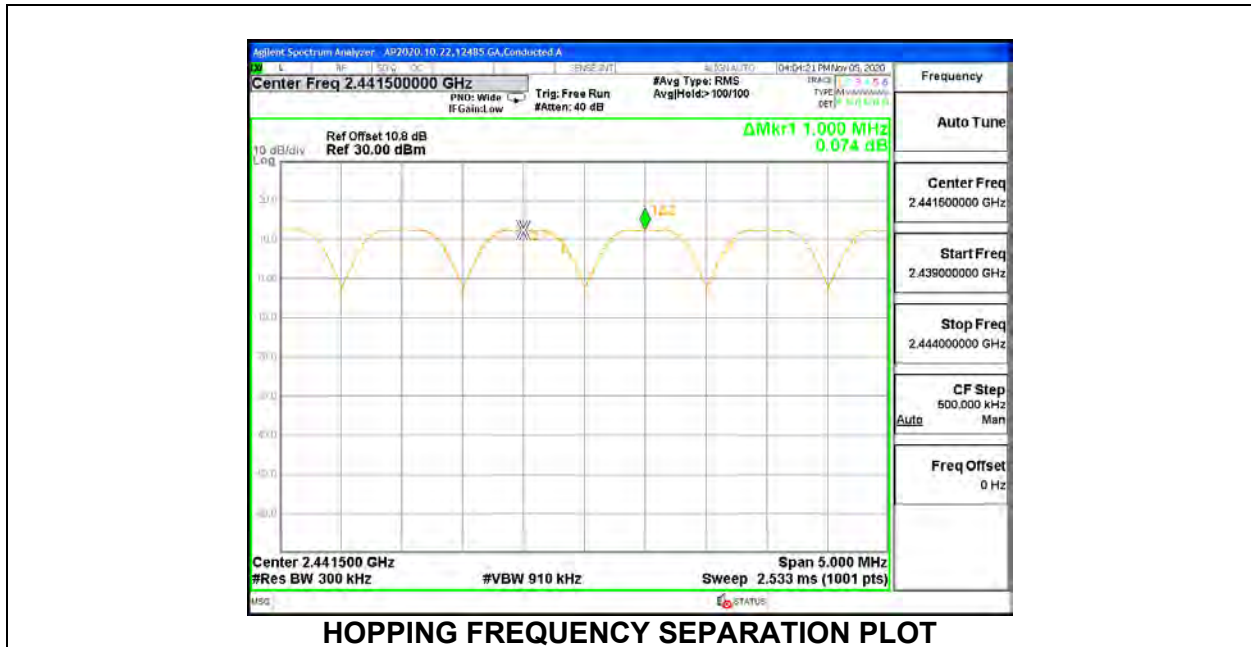
Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than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

TEST PROCEDURE

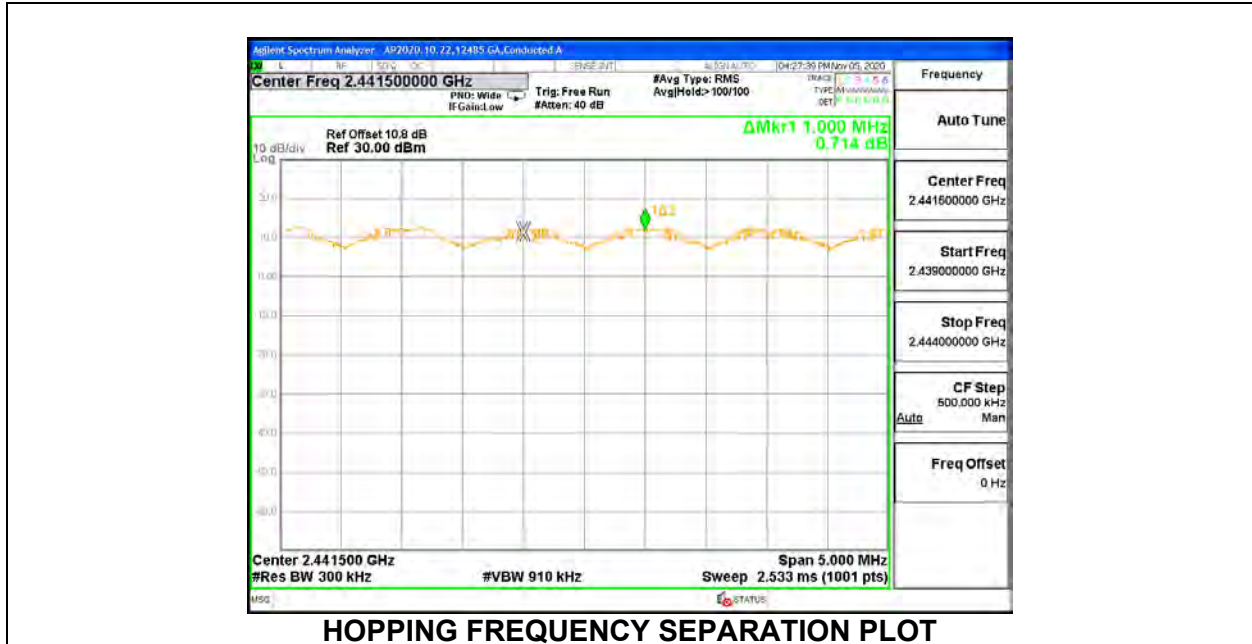
The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to $VBW \geq RBW$. The sweep time is coupled.

RESULTS

9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



9.4. 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.

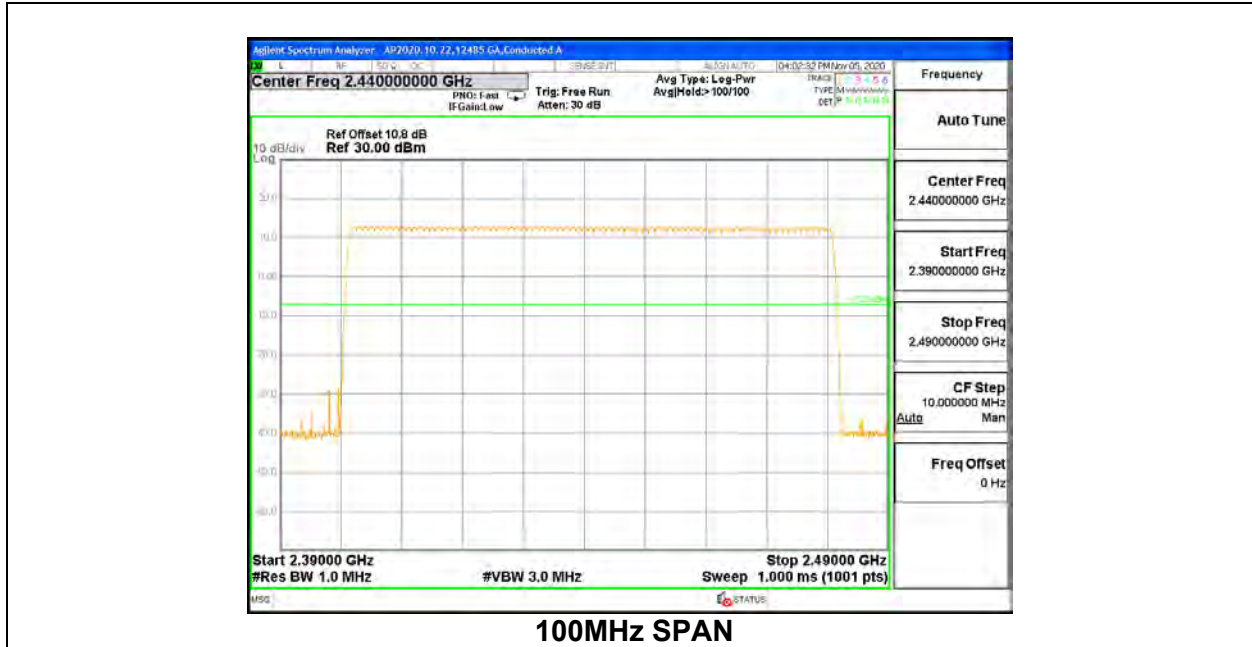
TEST PROCEDURE

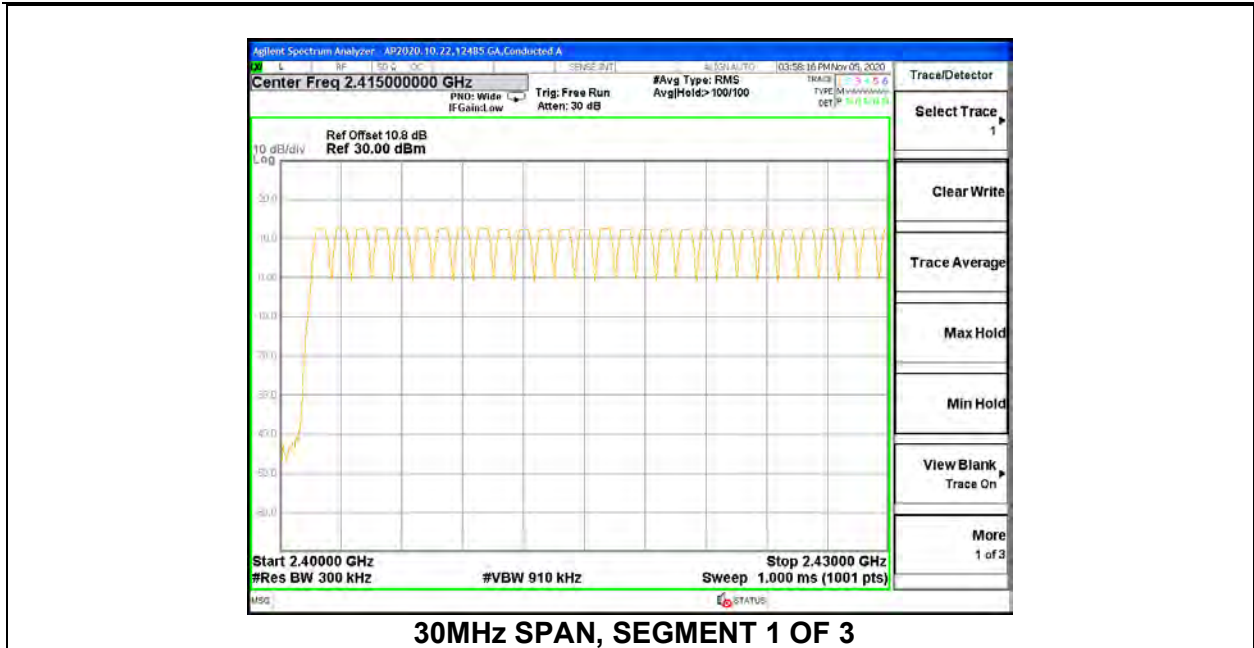
The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

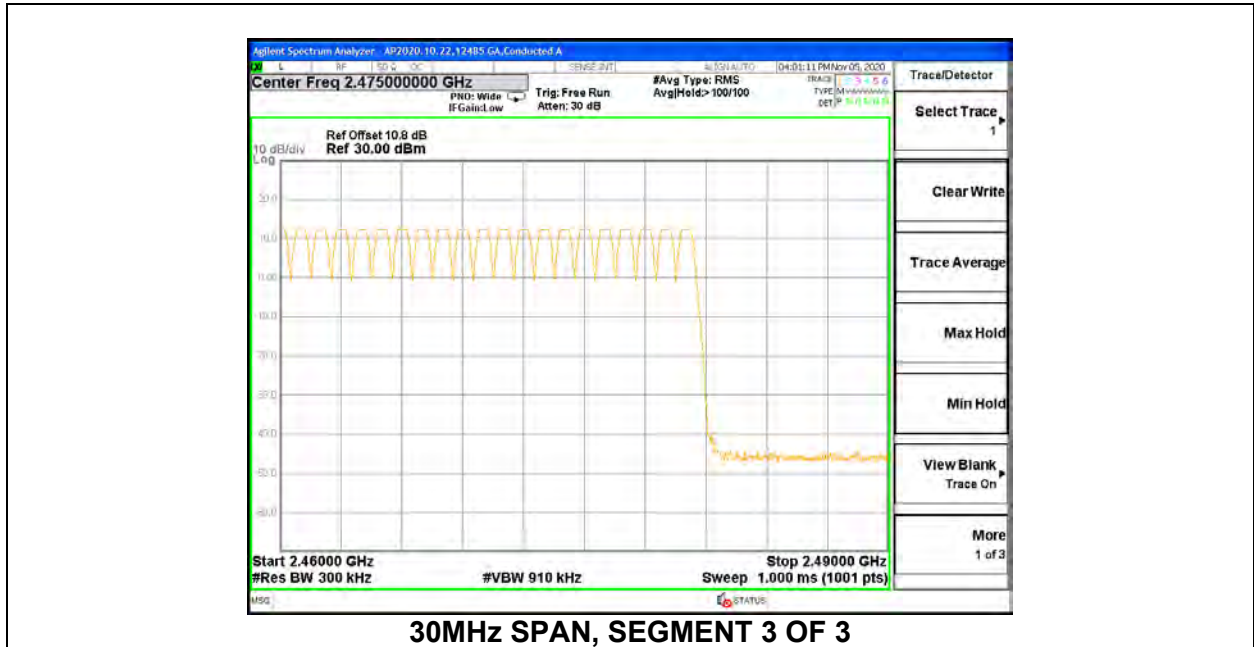
Normal Mode: 79 Channels Observed

9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



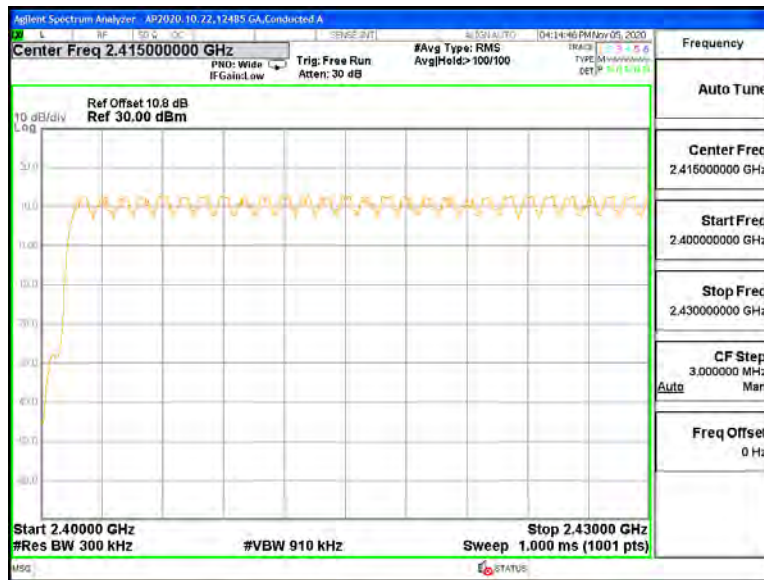






9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

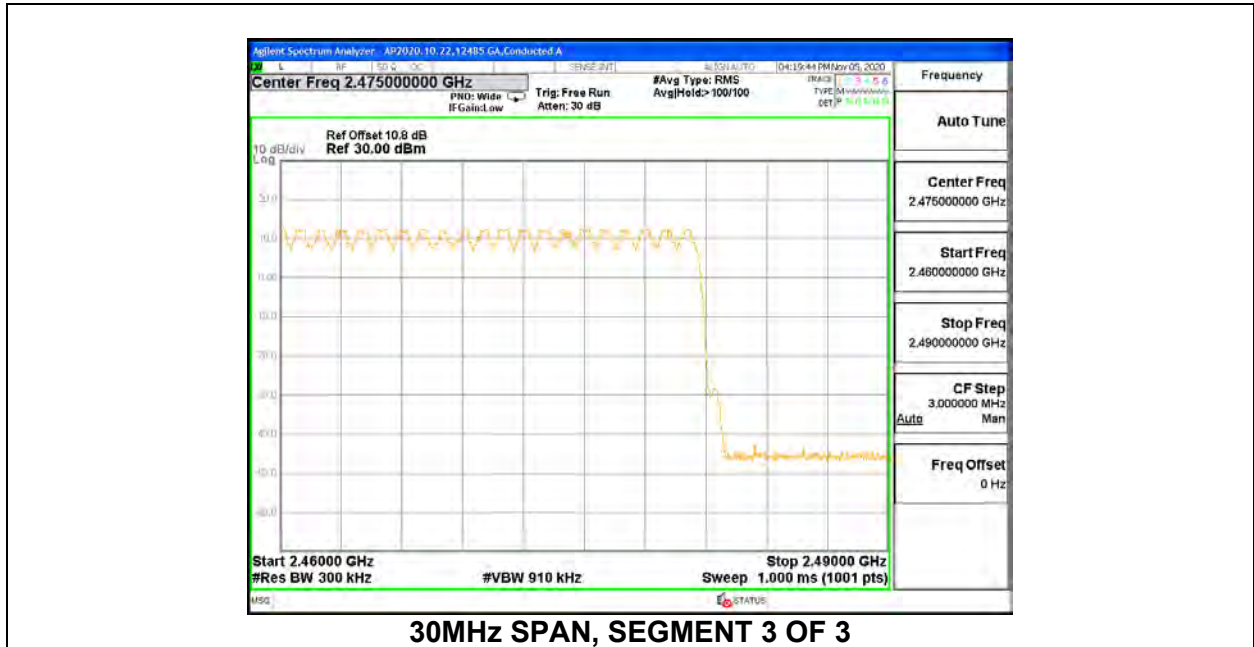




30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



9.5. 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 $10 * (\# \text{ of pulses in } 3.16 \text{ s}) * \text{ pulse width}$.

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

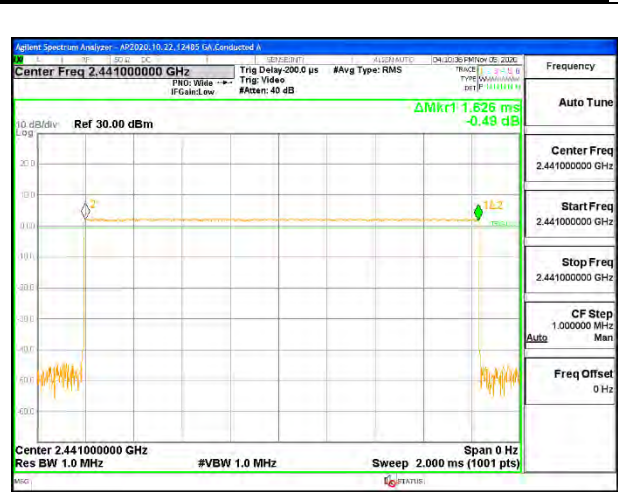
RESULTS

9.5.1. 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	0.373	18	0.0671	0.4	-0.3329
DH3	1.626	18	0.2927	0.4	-0.1073
DH5	2.868	7	0.2008	0.4	-0.1992
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	0.373	4.5	0.01679	0.4	-0.3832
DH3	1.626	4.5	0.07317	0.4	-0.3268
DH5	2.868	1.75	0.05019	0.4	-0.3498



PULSE WIDTH – DH1



PULSE WIDTH – DH3



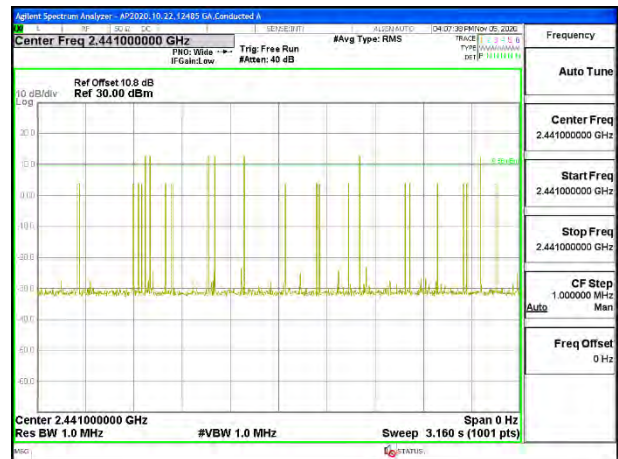
PULSE WIDTH – DH5



**NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH1**



**NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH3**

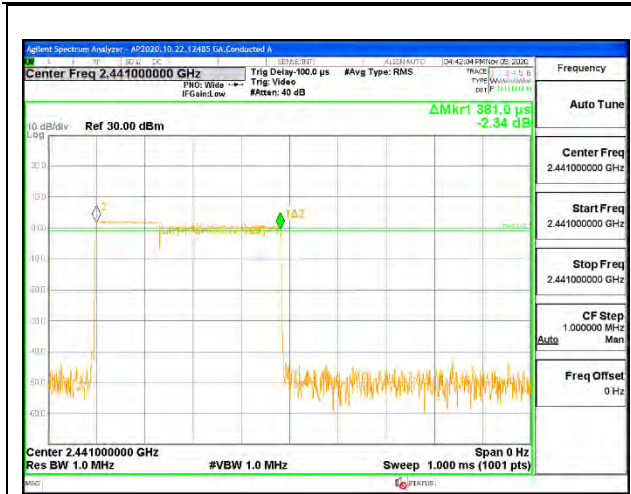


**NUMBER OF PULSES IN 3.16 SECOND
OBSERVATION PERIOD – DH5**

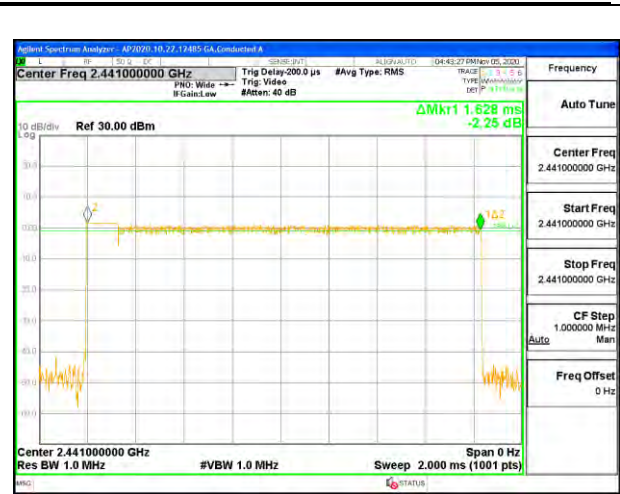
9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width (msec)	Number of Pulses in 3.16 seconds	Average Time of Occupancy (sec)	Limit (sec)	Margin (sec)
8PSK Normal Mode					
3DH1	0.381	12	0.04572	0.4	-0.3543
3DH3	1.628	17	0.27676	0.4	-0.1232
3DH5	2.872	7	0.20104	0.4	-0.199

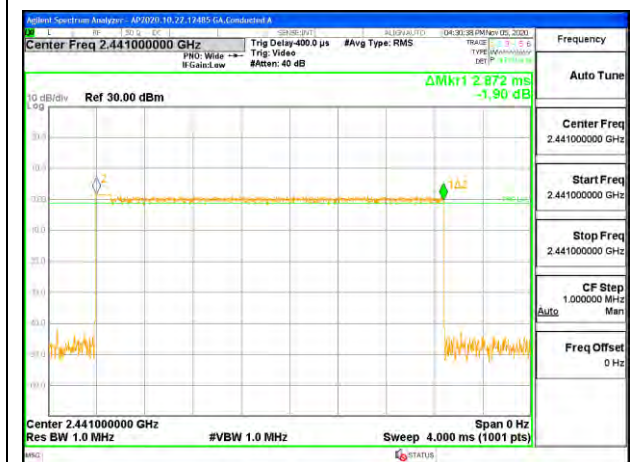
Note: for AFH(8PSK) mode, please refer to the results of AFH(GFSK) mode; the channel selection and hopping rate are the same for both EDR and Basic Rate operation, data for Basic Rate demonstrates compliance with channel occupancy when AFH is employed.



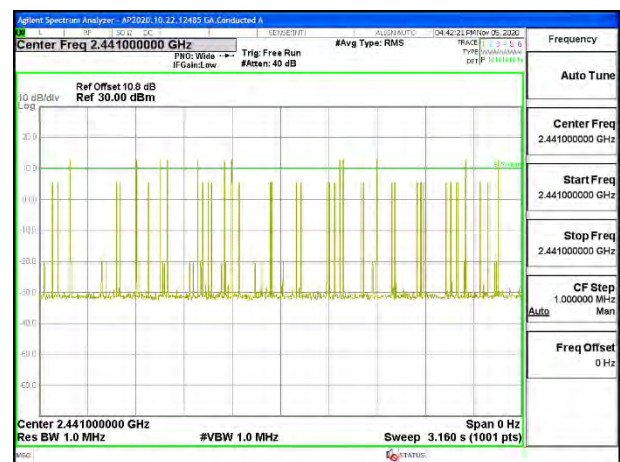
PULSE WIDTH – 3DH1



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**

9.6. 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.

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

TEST PROCEDURE

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband peak power sensor. Peak output power was read directly from power meter

RESULTS

9.6.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	12485
Date:	11/4/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.19	21	-8.81
Middle	2441	12.26	21	-8.74
High	2480	12.17	21	-8.83

9.6.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	12485
Date:	11/4/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.12	21	-8.88
Middle	2441	12.19	21	-8.81
High	2480	12.25	21	-8.75

9.6.3. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	12485
Date:	11/4/2020

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2402	12.04	21	-8.96
Middle	2441	12.12	21	-8.88
High	2480	12.19	21	-8.81

9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

The power output was measured on the EUT antenna port using SMA cable with 10dB attenuator connected to a power meter via wideband average power sensor. Gated average output power was read directly from power meter.

RESULTS

9.7.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Tested By:	12485
Date	11/4/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	11.83
Middle	2441	11.9
High	2480	11.8

9.7.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Tested By:	12485
Date	11/4/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.2
Middle	2441	8.26
High	2480	8.21

9.7.3. BLUETOOTH ENHANCED DATA RATE DQPSK MODULATION

Tested By:	12485
Date	11/4/2020

Channel	Frequency (MHz)	Average Power (dBm)
Low	2402	8.17
Middle	2441	8.15
High	2480	8.13

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

RESULTS

9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

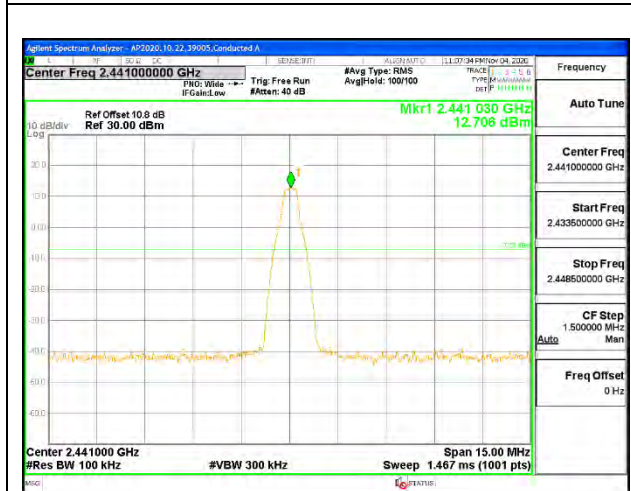
SPURIOUS EMISSIONS, NON-HOPPING



LOW CHANNEL BANDEDGE



OUT-OF-BAND LOW CHANNEL



IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

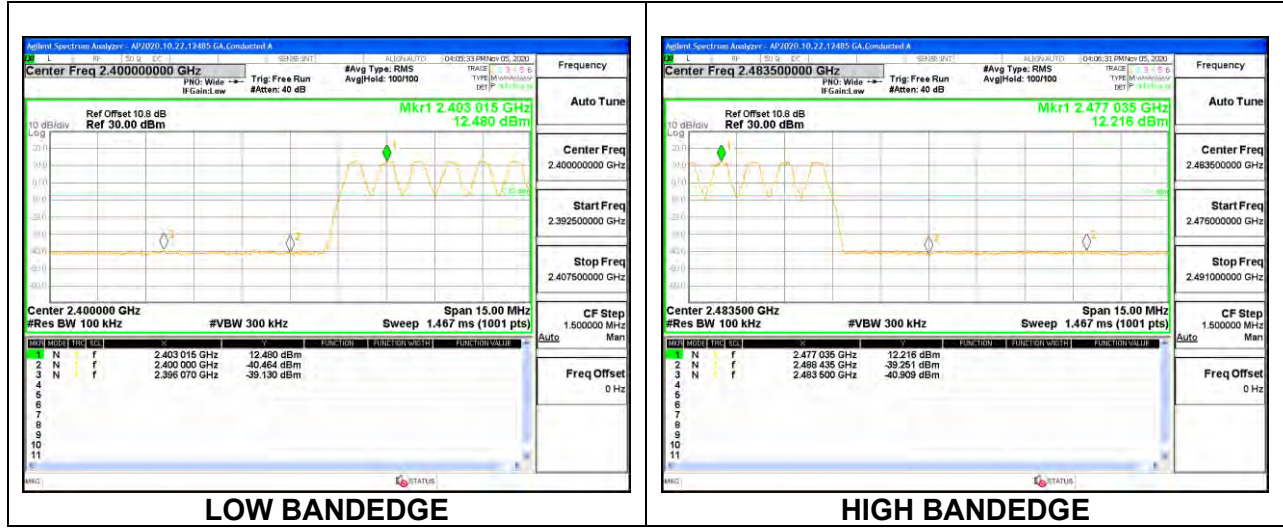


HIGH CHANNEL BANDEDGE



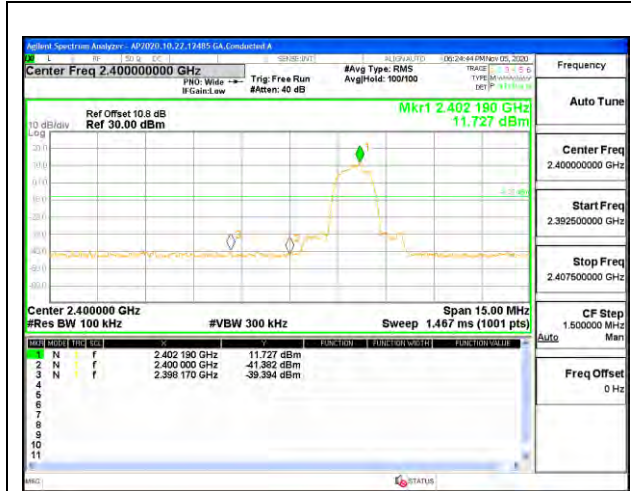
OUT-OF-BAND HIGH CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON

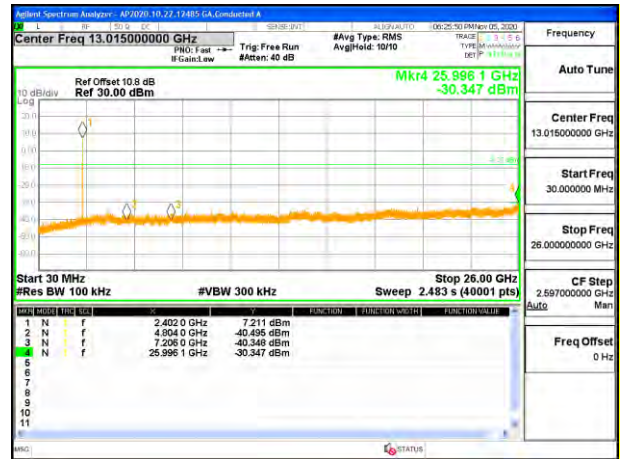


9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

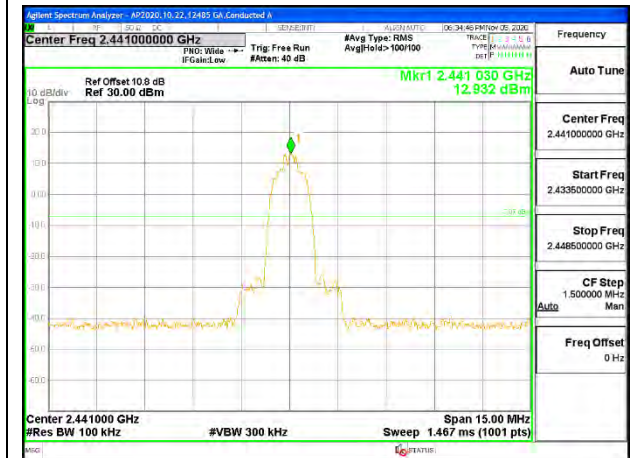
SPURIOUS EMISSIONS, NON-HOPPING



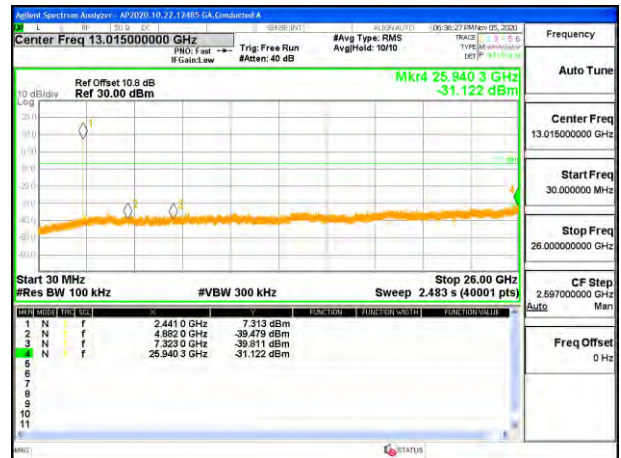
LOW CHANNEL BANDEDGE



OUT-OF-BAND LOW CHANNEL



IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL

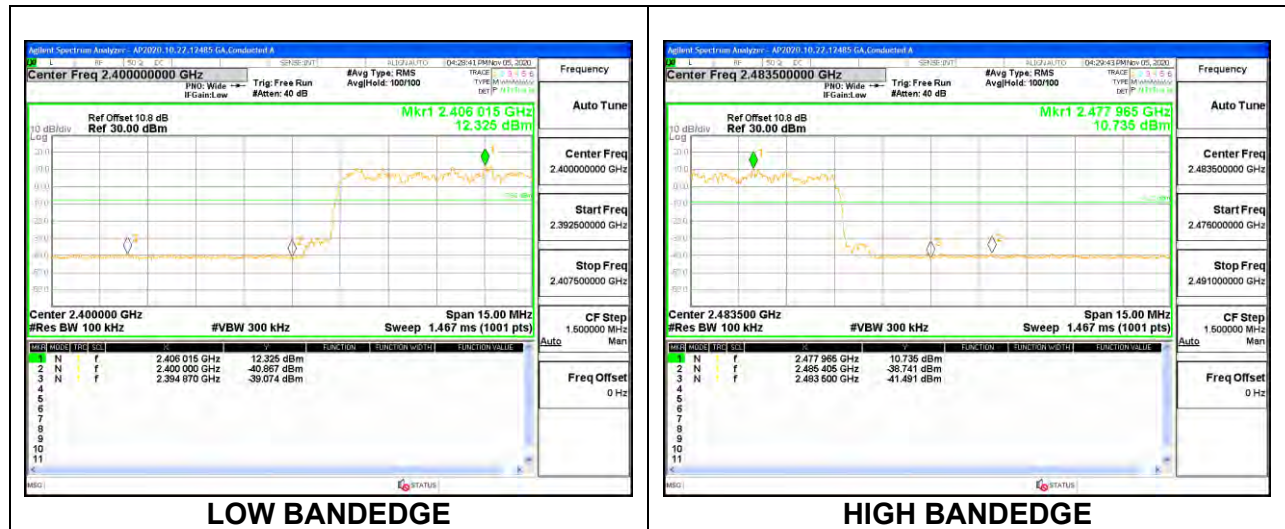


HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



10. 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 measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T 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.

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.

2D antenna use - 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.

The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table), using the free space impedance of 377 Ohms. For example the measurement at frequency X kHz resulted in a level of Y dBuV/m, which is equivalent to $Y - 51.5 = Z$ dBuA/m, which has the same margin, W dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

KDB 414788 Open Field Site(OFS) 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.

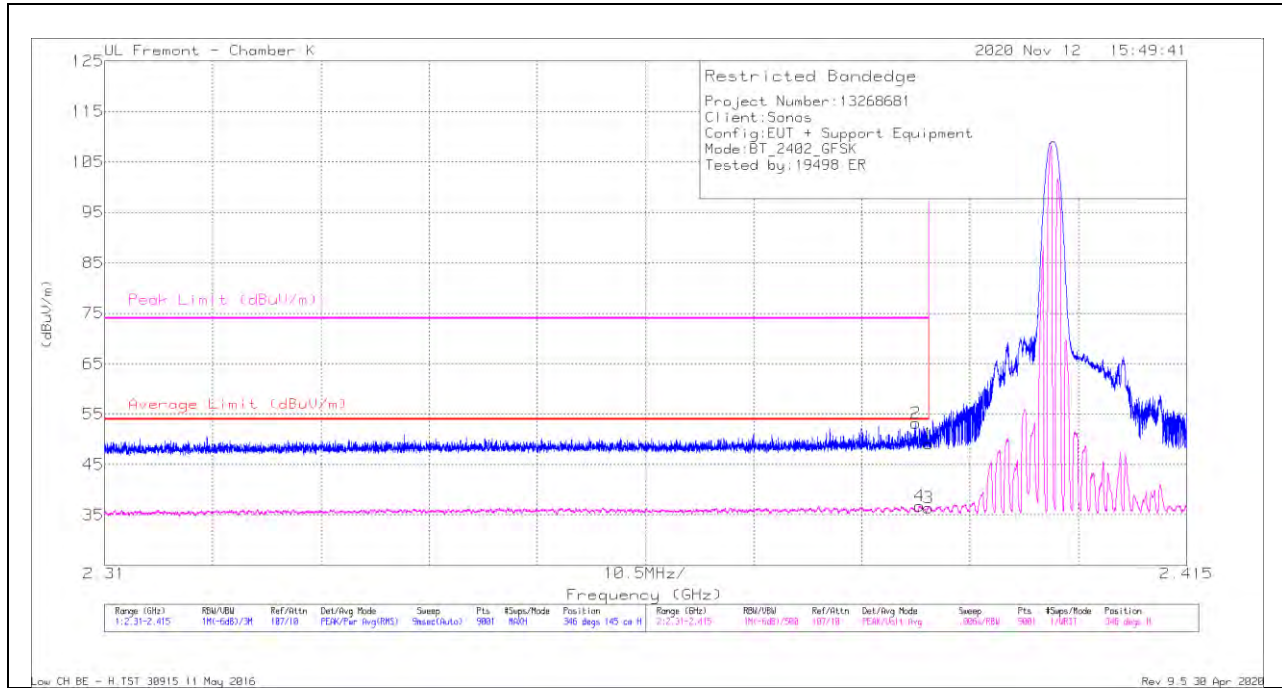
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

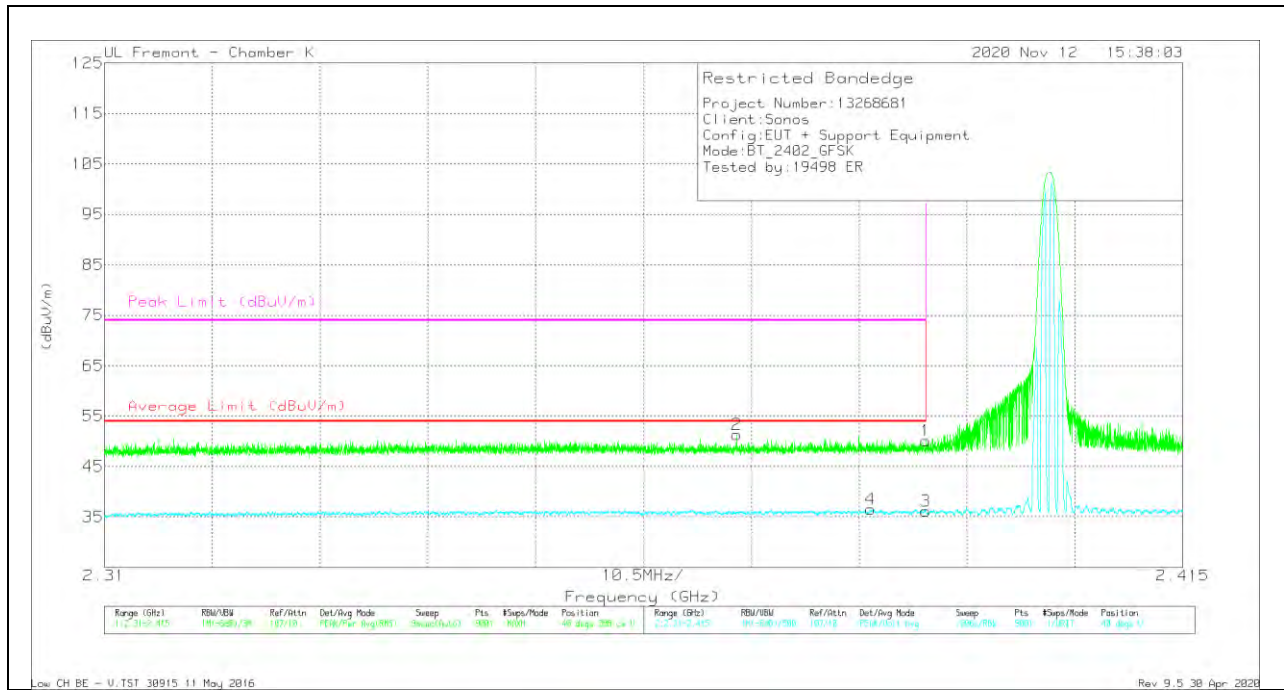
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbll/Filtr/Par d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	51.65	Pk	32.4	-35	49.05	-	-	74	-24.95	346	145	H
2	* 2.38874	55.76	Pk	32.4	-35	53.16	-	-	74	-20.84	346	145	H
3	* 2.38999	39.05	VA1T	32.4	-35	36.45	54	-17.55	-	-	346	145	H
4	* 2.38909	39.44	VA1T	32.4	-35	36.84	54	-17.16	-	-	346	145	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average $V_B=1/T_{on}$ where: T_{on} is transmit duration

VERTICAL RESULT



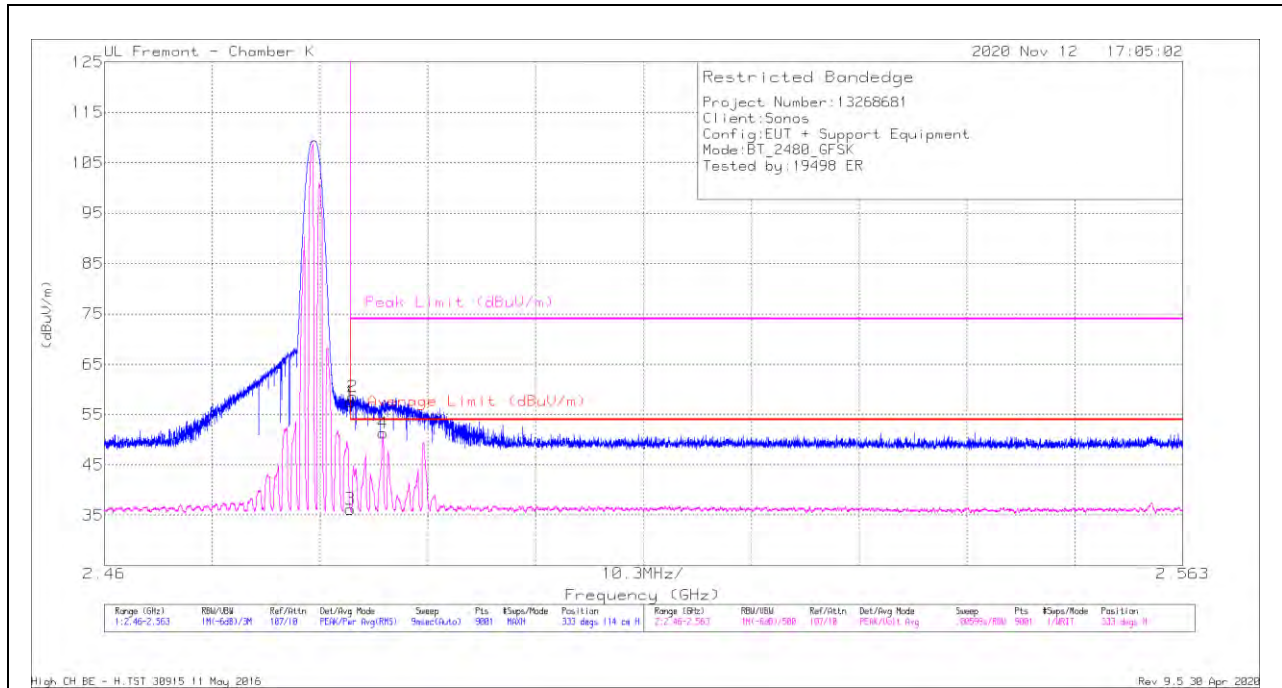
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbll/Filtr/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	52.67	Pk	32.4	-35	50.07	-	-	74	-23.93	40	388	V
2	* 2.37156	53.98	Pk	32.4	-35.1	51.28	-	-	74	-22.72	40	388	V
3	* 2.38999	38.79	VA1T	32.4	-35	36.19	54	-17.81	-	-	40	388	V
4	* 2.38463	39.15	VA1T	32.4	-35	36.55	54	-17.45	-	-	40	388	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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

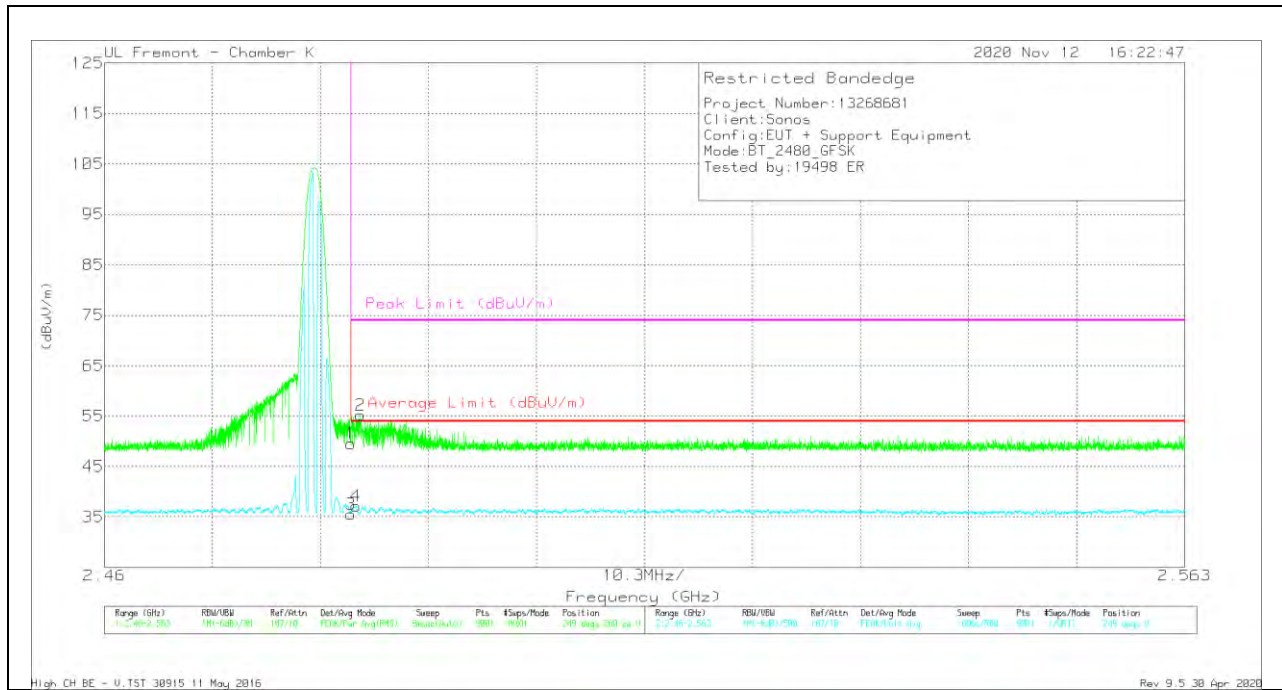
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	59.64	Pk	32.5	-34.6	57.54	-	-	74	-16.46	333	114	H
2	* 2.48375	60.66	Pk	32.5	-34.6	58.56	-	-	74	-15.44	333	114	H
3	* 2.48351	38.33	VA1T	32.5	-34.6	36.23	54	-17.77	-	-	333	114	H
4	* 2.48663	53.43	VA1T	32.5	-34.6	51.33	54	-2.67	-	-	333	114	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

VERTICAL RESULT



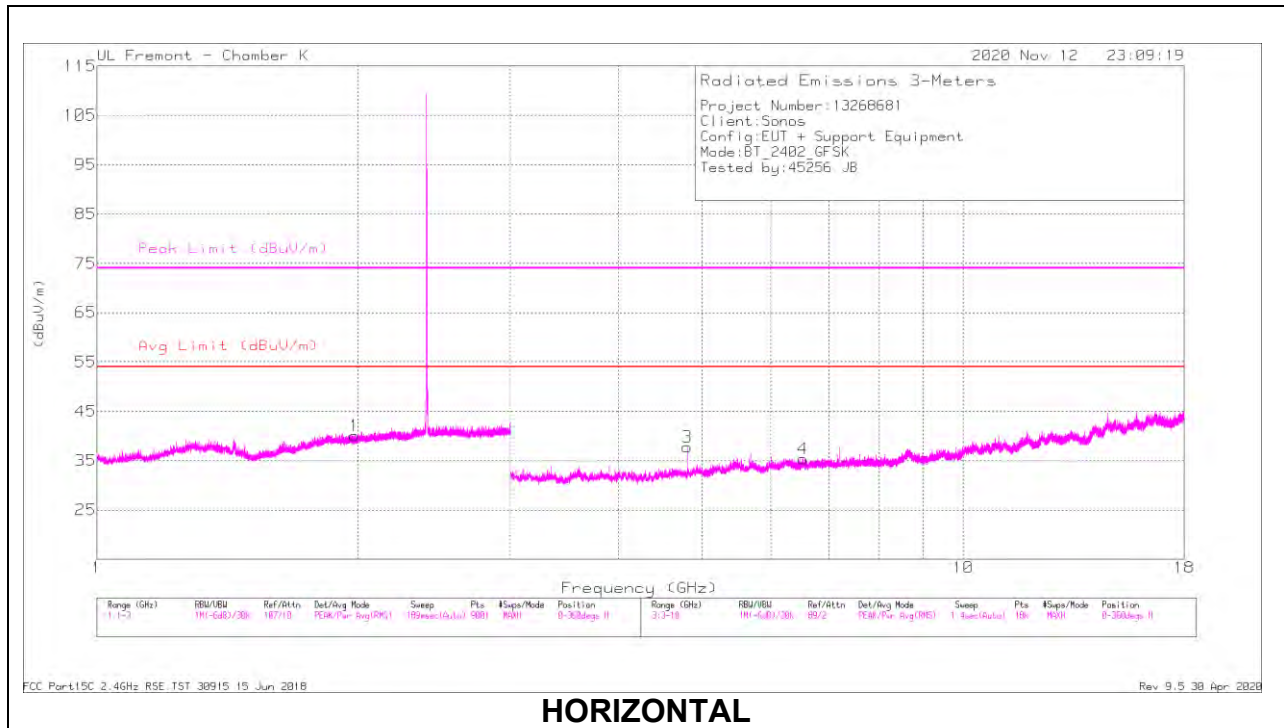
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbll/Filtr/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	51.63	Pk	32.5	-34.6	49.53	-	-	74	-24.47	249	260	V
2	* 2.48444	57.23	Pk	32.5	-34.6	55.13	-	-	74	-18.87	249	260	V
3	* 2.48351	37.69	VA1T	32.5	-34.6	35.59	54	-18.41	-	-	249	260	V
4	* 2.48398	39.27	VA1T	32.5	-34.6	37.17	54	-16.83	-	-	249	260	V

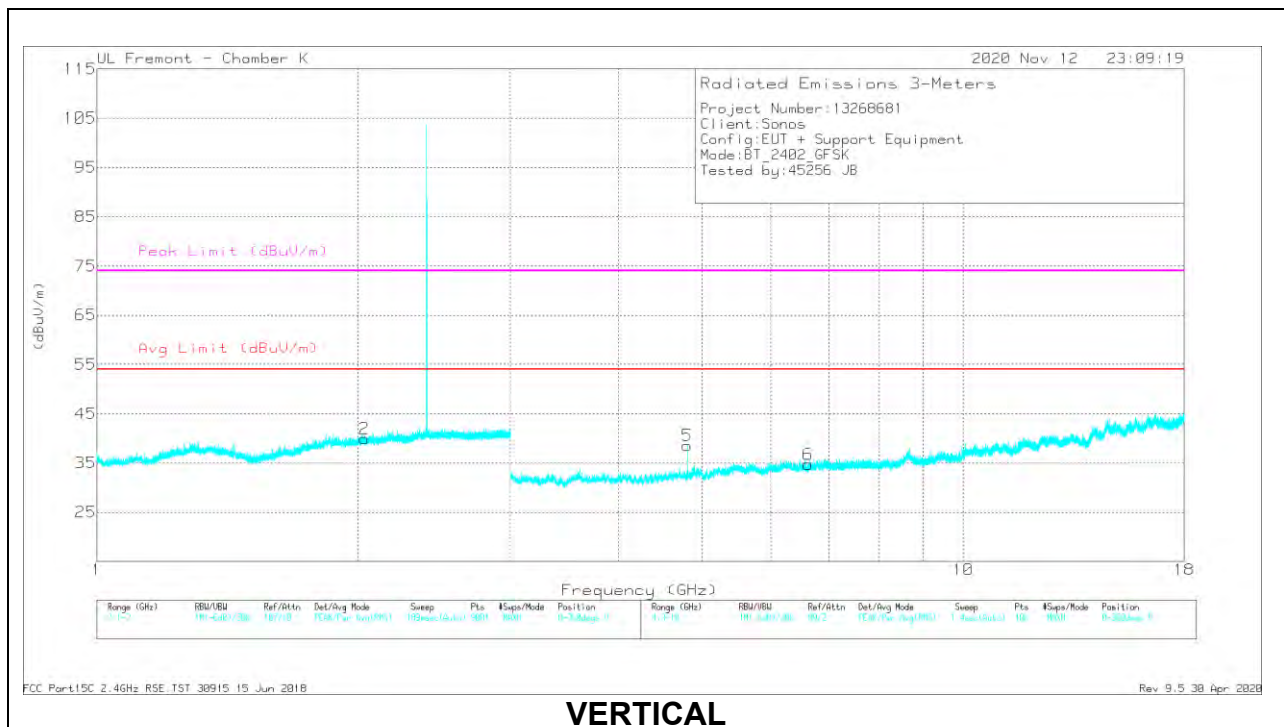
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
 Pk - Peak detector
 VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

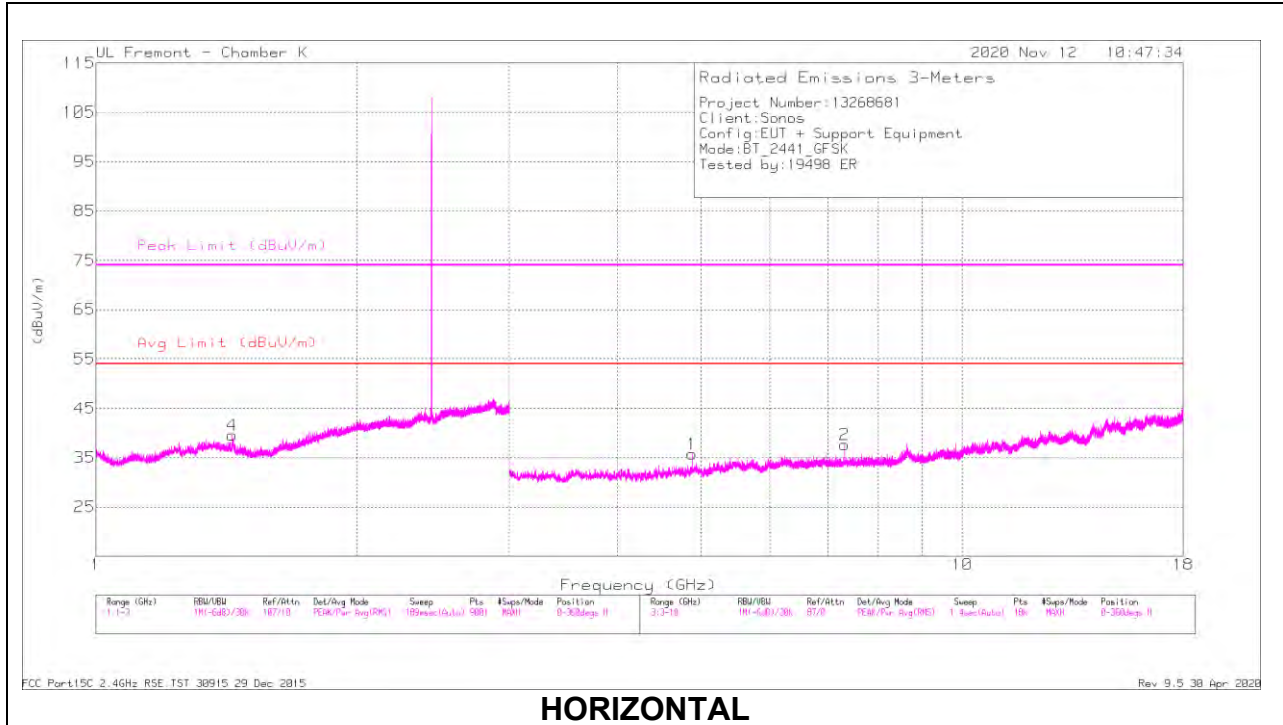
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fitr/Prod (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.98333	44.94	Pk	31	-35.9	40.04	-	-	-	-	0-360	200	H
2	2.03667	44.37	Pk	31.4	-35.8	39.97	-	-	-	-	0-360	200	V
3	* 4.80387	50.16	PKFH	34.4	-40.8	43.76	-	-	74	-30.24	262	277	H
	* 4.80403	42.96	VA1T	34.4	-40.8	36.56	54	-17.44	-	-	262	277	H
4	6.53936	38.69	Pk	35.8	-39.1	35.39	-	-	-	-	0-360	100	H
5	* 4.80429	50.55	PKFH	34.4	-40.7	44.25	-	-	74	-29.75	163	101	V
	* 4.80405	43.5	VA1T	34.4	-40.8	37.1	54	-16.9	-	-	163	101	V
6	6.61937	37.93	Pk	35.9	-39.1	34.73	-	-	-	-	0-360	199	V

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

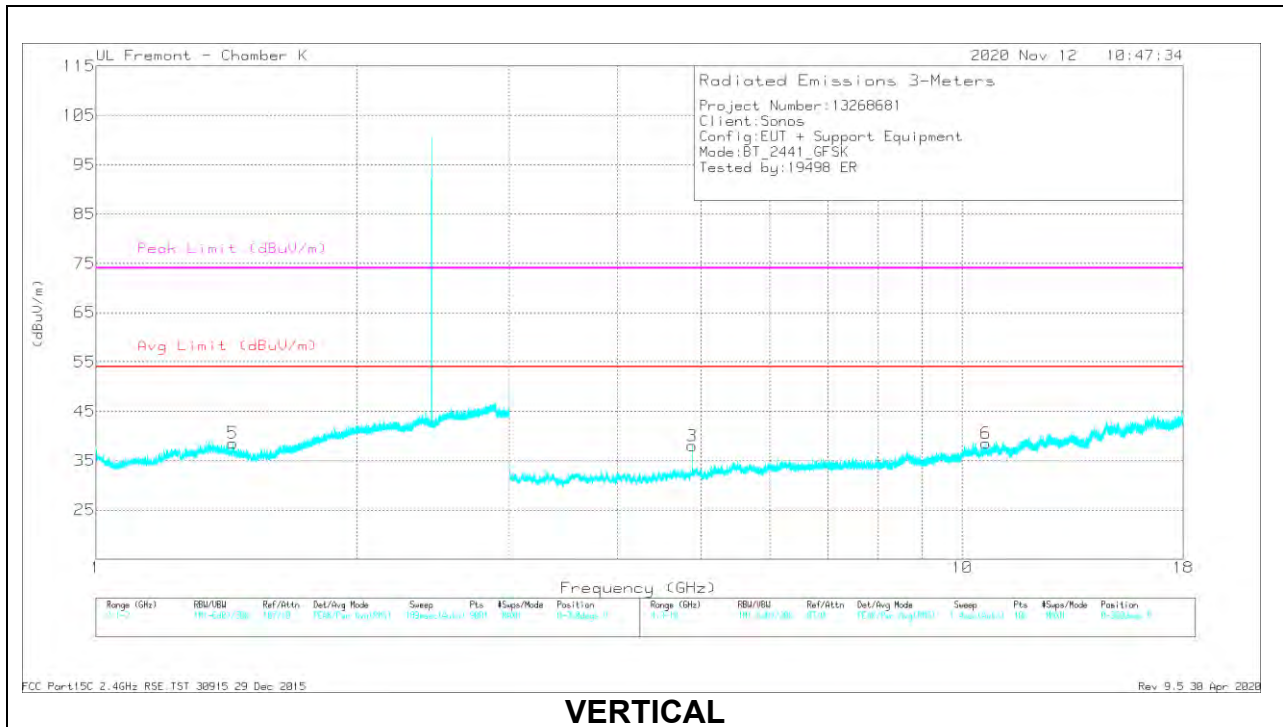
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

MID CHANNEL RESULTS



HORIZONTAL



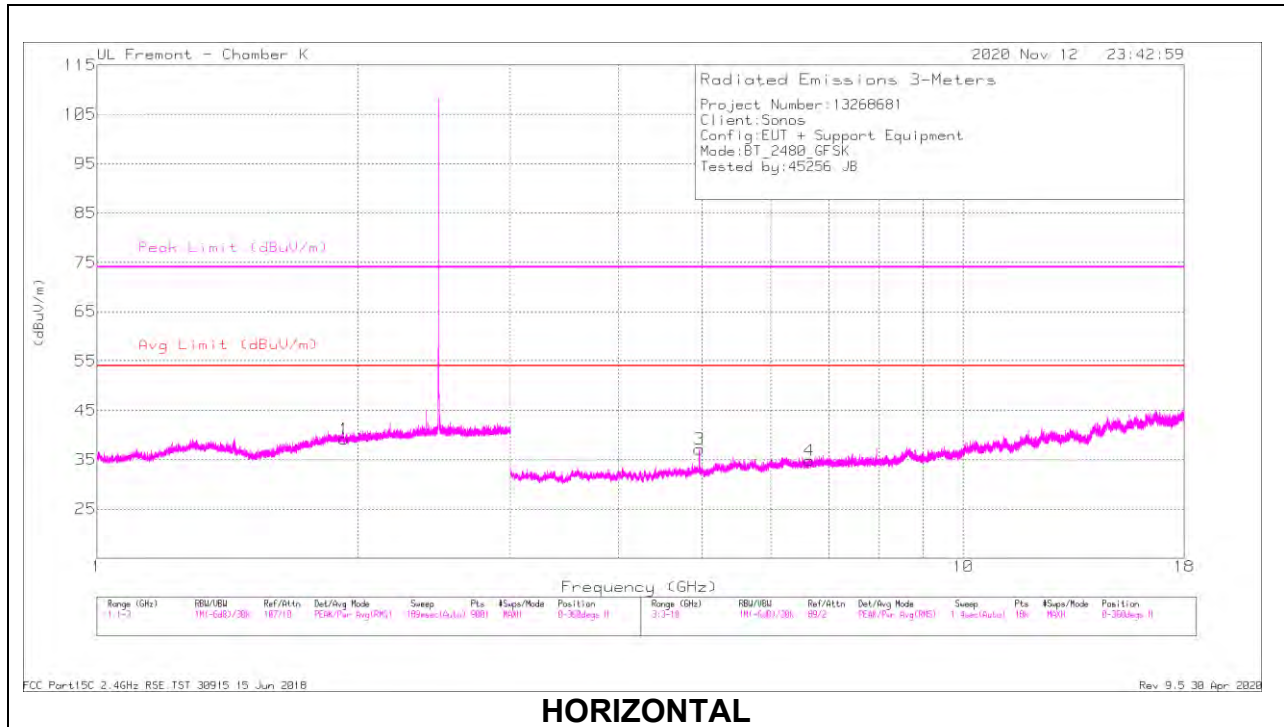
VERTICAL

RADIATED EMISSIONS

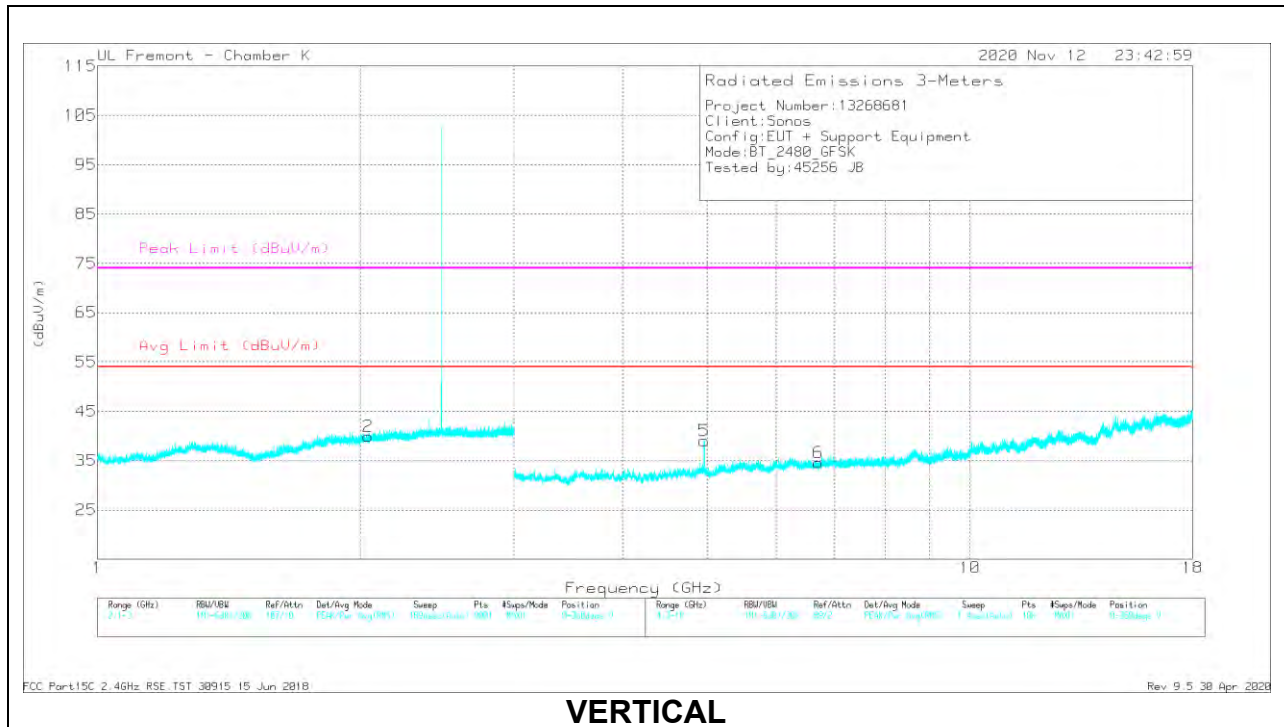
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/P ad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 1.43876	34.67	PKFH	28.4	-13.3	49.77	-	-	74	-24.23	318	167	H
	* 1.44005	18.92	VA1T	28.4	-13.3	34.02	54	-19.98	-	-	318	167	H
5	* 1.44055	32.36	PKFH	28.4	-13.3	47.46	-	-	74	-26.54	304	272	V
	* 1.43997	17.99	VA1T	28.4	-13.3	33.09	54	-20.91	-	-	304	272	V
1	* 4.88171	49.65	PKFH	34.3	-40.6	43.35	-	-	74	-30.65	116	109	H
	* 4.88207	40.86	VA1T	34.3	-40.6	34.56	54	-19.44	-	-	116	109	H
2	* 7.32316	46.64	PKFH	36.1	-38.2	44.54	-	-	74	-29.46	287	97	H
	* 7.32303	36.6	VA1T	36.1	-38.2	34.5	54	-19.5	-	-	287	97	H
3	* 4.88224	50.66	PKFH	34.3	-40.6	44.36	-	-	74	-29.64	163	167	V
	* 4.88213	42.13	VA1T	34.3	-40.6	35.83	54	-18.17	-	-	163	167	V
6	* 10.65868	44.22	PKFH	38	-36.4	45.82	-	-	74	-28.18	95	185	V
	* 10.65858	31.56	VA1T	38	-36.4	33.16	54	-20.84	-	-	95	185	V

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

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/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	1.92933	44.53	Pk	30.8	-36.1	39.23	-	-	-	-	0-360	200	H
2	2.04378	44.48	Pk	31.3	-35.9	39.88	-	-	-	-	0-360	200	V
3	* 4.95971	49.39	PKFH	34.3	-40.6	43.09	-	-	74	-30.91	118	105	H
	* 4.96006	40.95	VA1T	34.3	-40.7	34.55	54	-19.45	-	-	118	105	H
4	6.65104	37.73	Pk	35.9	-38.8	34.83	-	-	-	-	0-360	100	H
5	* 4.96018	50.01	PKFH	34.3	-40.7	43.61	-	-	74	-30.39	308	110	V
	* 4.95984	41.68	VA1T	34.3	-40.7	35.28	54	-18.72	-	-	308	110	V
6	6.70604	37.46	Pk	35.9	-38.8	34.56	-	-	-	-	0-360	100	V

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

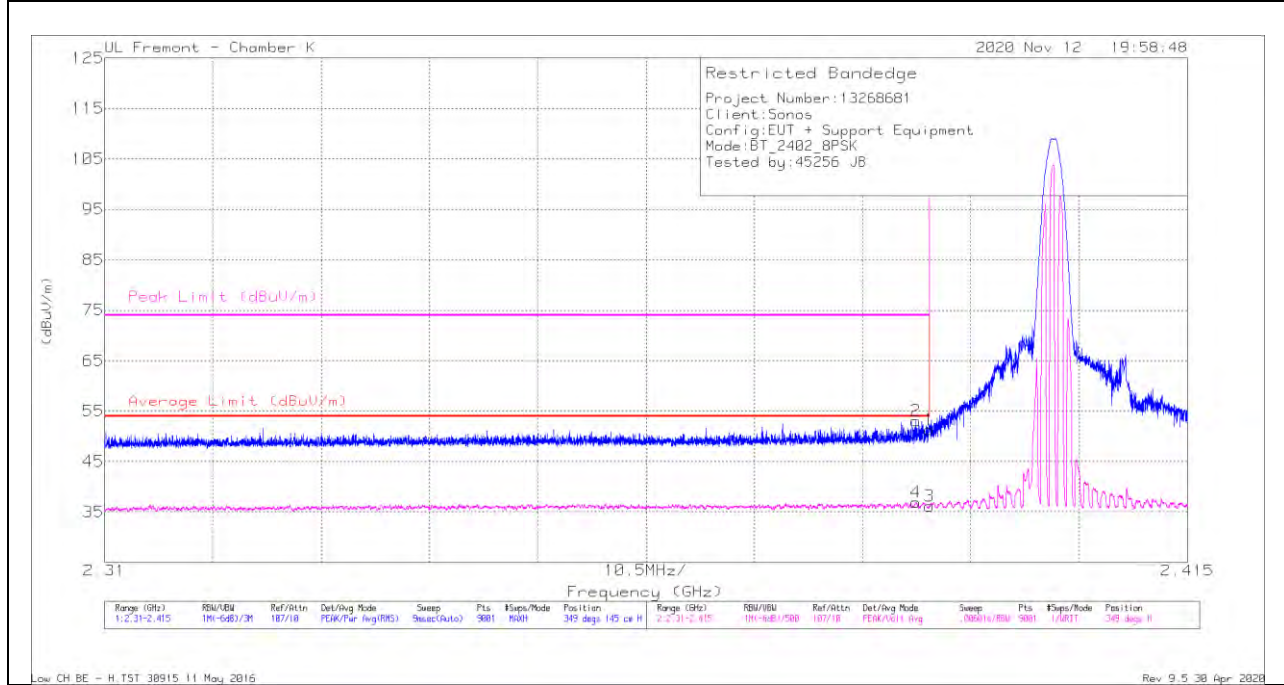
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



Trace Markers

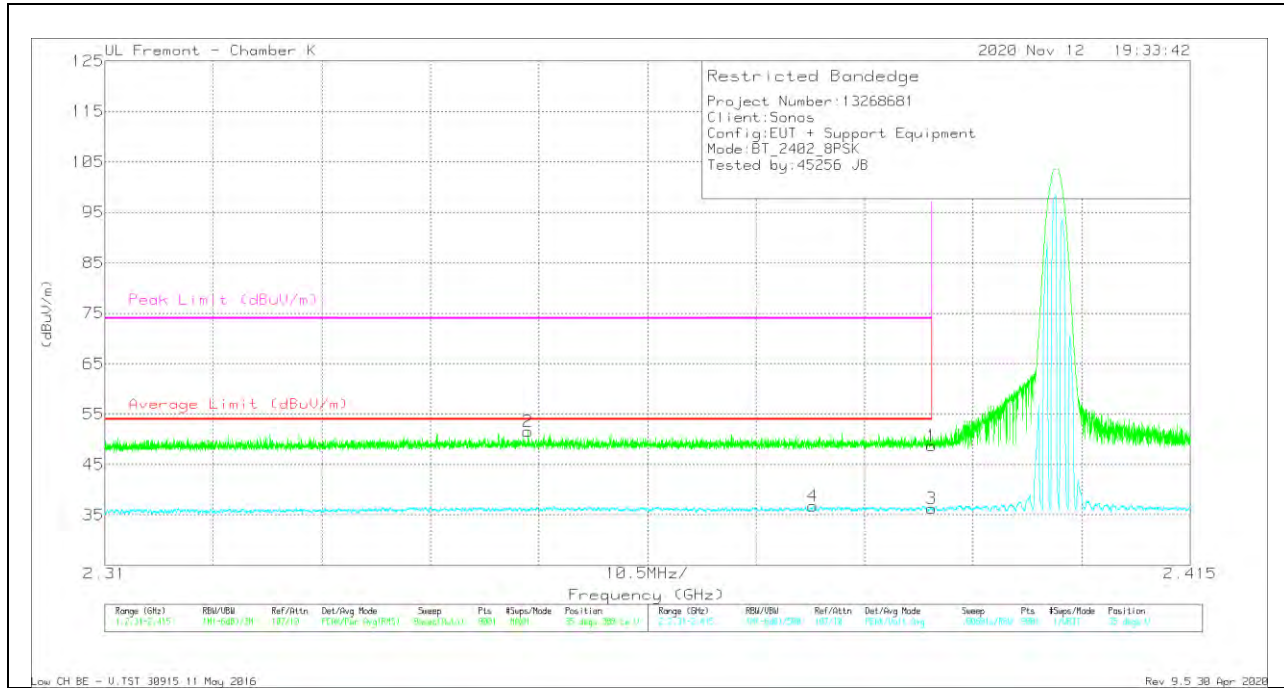
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/CbI/Fitr/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	53.98	Pk	32.4	-35	51.38	-	-	74	-22.62	349	145	H
2	* 2.38866	55.65	Pk	32.4	-35	53.05	-	-	74	-20.95	349	145	H
3	* 2.38999	38.81	VA1T	32.4	-35	36.21	54	-17.79	-	-	349	145	H
4	* 2.38867	39.47	VA1T	32.4	-35	36.87	54	-17.13	-	-	349	145	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

VERTICAL RESULT



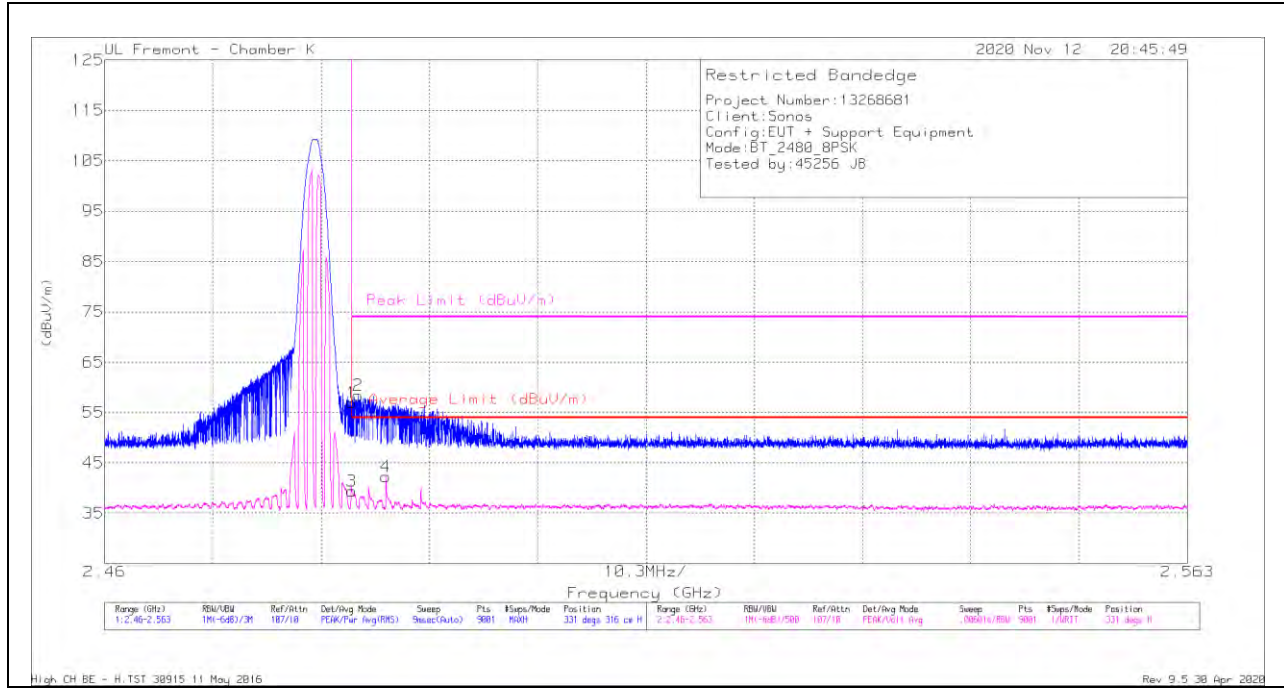
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbll/Filtr/Par d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	51.35	Pk	32.4	-35	48.75	-	-	74	-25.25	35	388	V
2	* 2.35093	54.43	Pk	32.3	-35.2	51.53	-	-	74	-22.47	35	388	V
3	* 2.38999	38.89	VA1T	32.4	-35	36.29	54	-17.71	-	-	35	388	V
4	* 2.3785	39.53	VA1T	32.4	-35.1	36.83	54	-17.17	-	-	35	388	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

BANDEDGE (HIGH CHANNEL)

HORIZONTAL RESULT

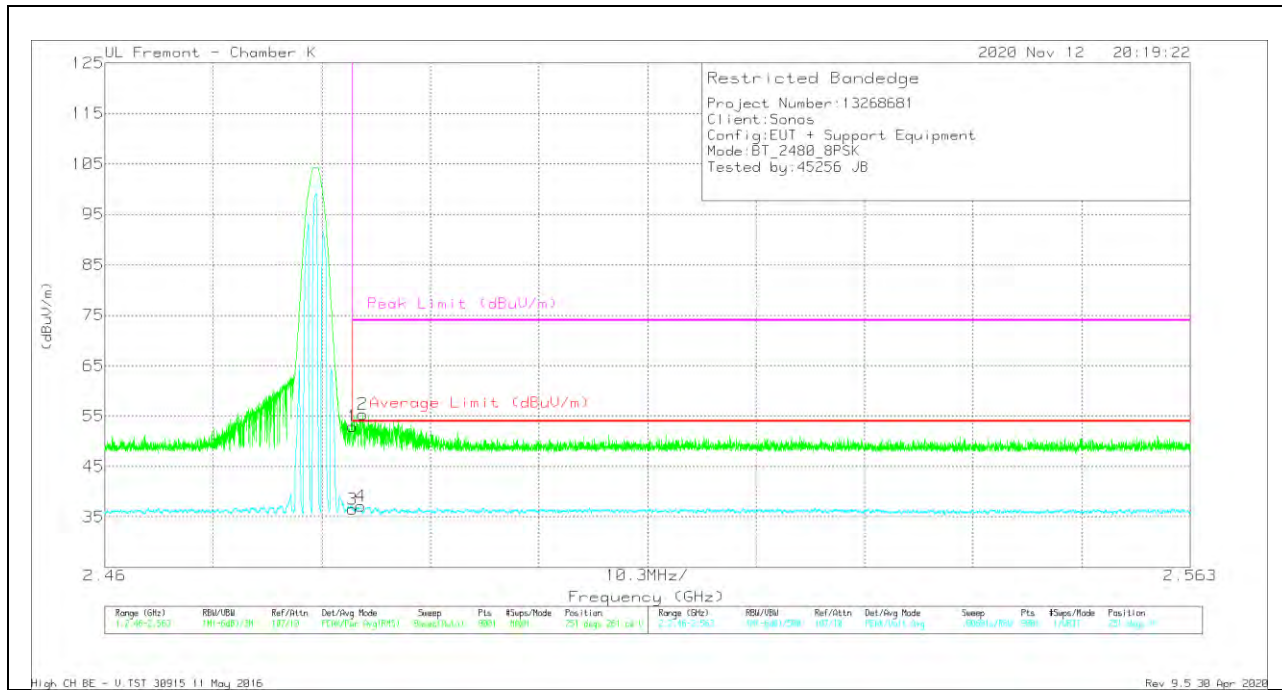


Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbll/Fitr/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	59	Pk	32.5	-34.6	56.9	-	-	74	-17.1	331	316	H
2	* 2.48409	60.54	Pk	32.5	-34.6	58.44	-	-	74	-15.56	331	316	H
3	* 2.48351	41.52	VA1T	32.5	-34.6	39.42	54	-14.58	-	-	331	316	H
4	* 2.48676	44.34	VA1T	32.5	-34.6	42.24	54	-11.76	-	-	331	316	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

VERTICAL RESULT



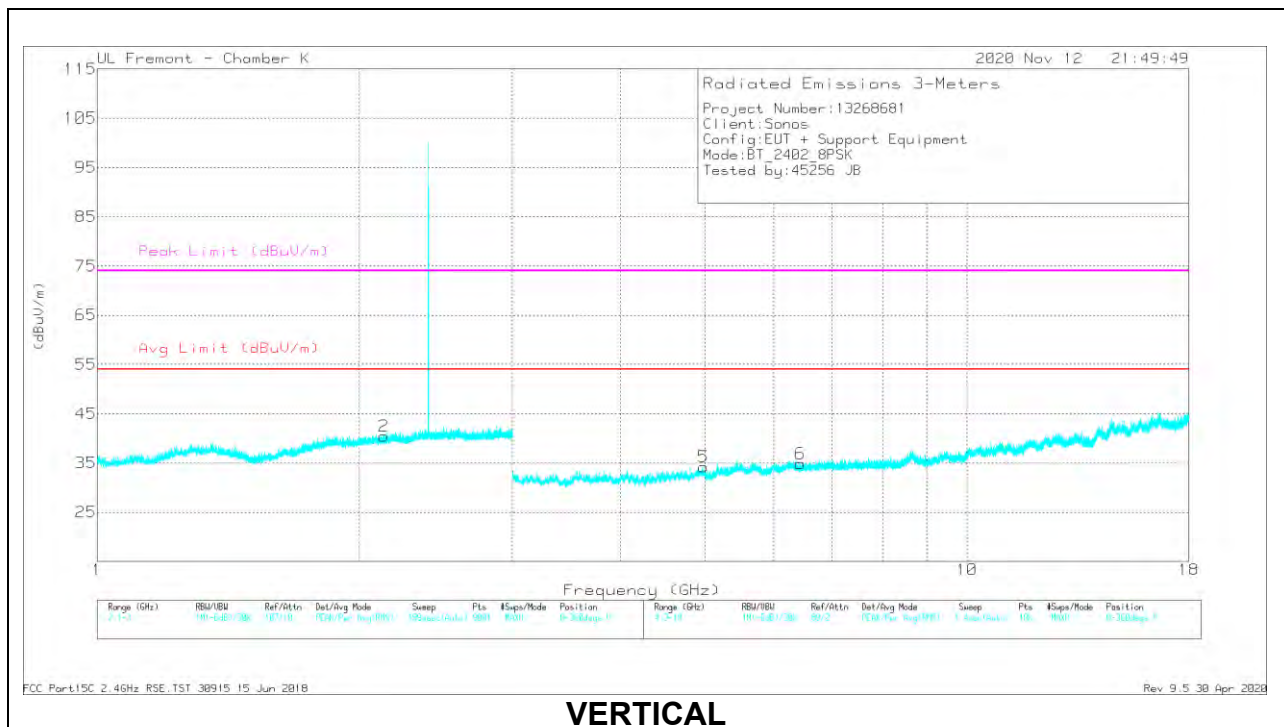
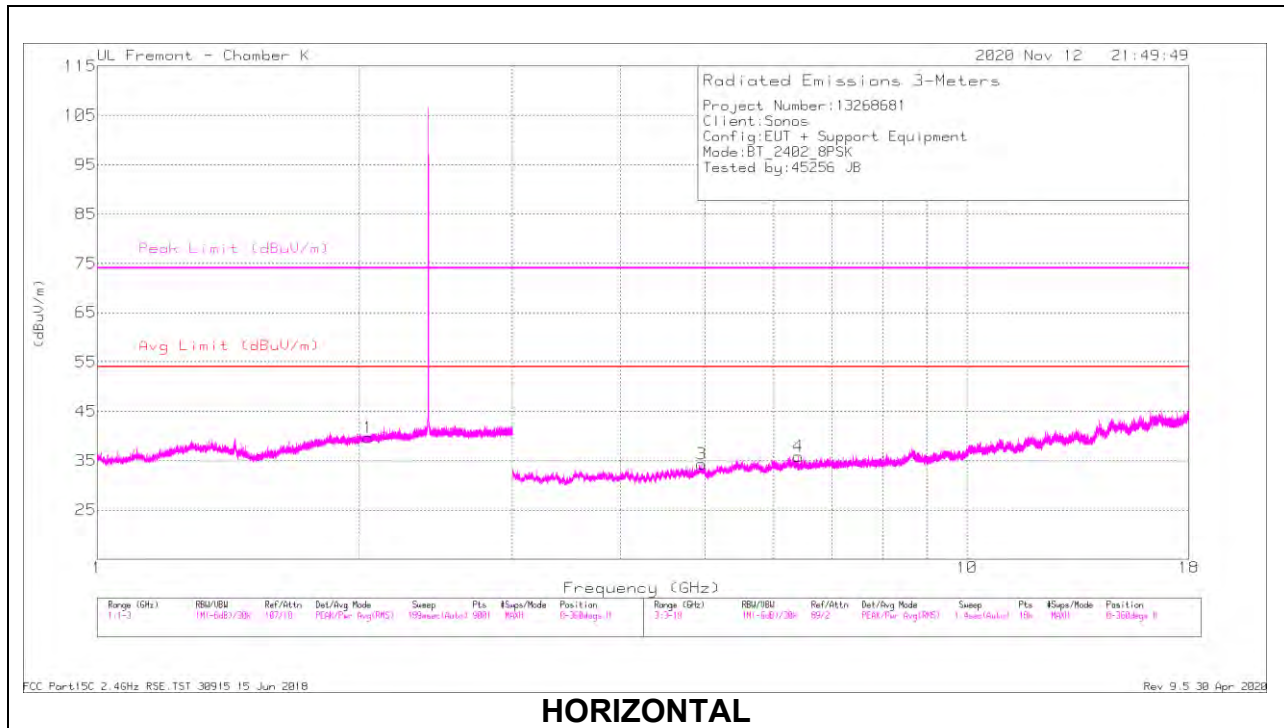
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/CbI/Ftr/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	55.08	Pk	32.5	-34.6	52.98	-	-	74	-21.02	251	261	V
2	* 2.48447	57.47	Pk	32.5	-34.6	55.37	-	-	74	-18.63	251	261	V
3	* 2.48351	38.62	VA1T	32.5	-34.6	36.52	54	-17.48	-	-	251	260	V
4	* 2.48431	39.21	VA1T	32.5	-34.6	37.11	54	-16.89	-	-	251	260	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 RESULTS



RADIATED EMISSIONS

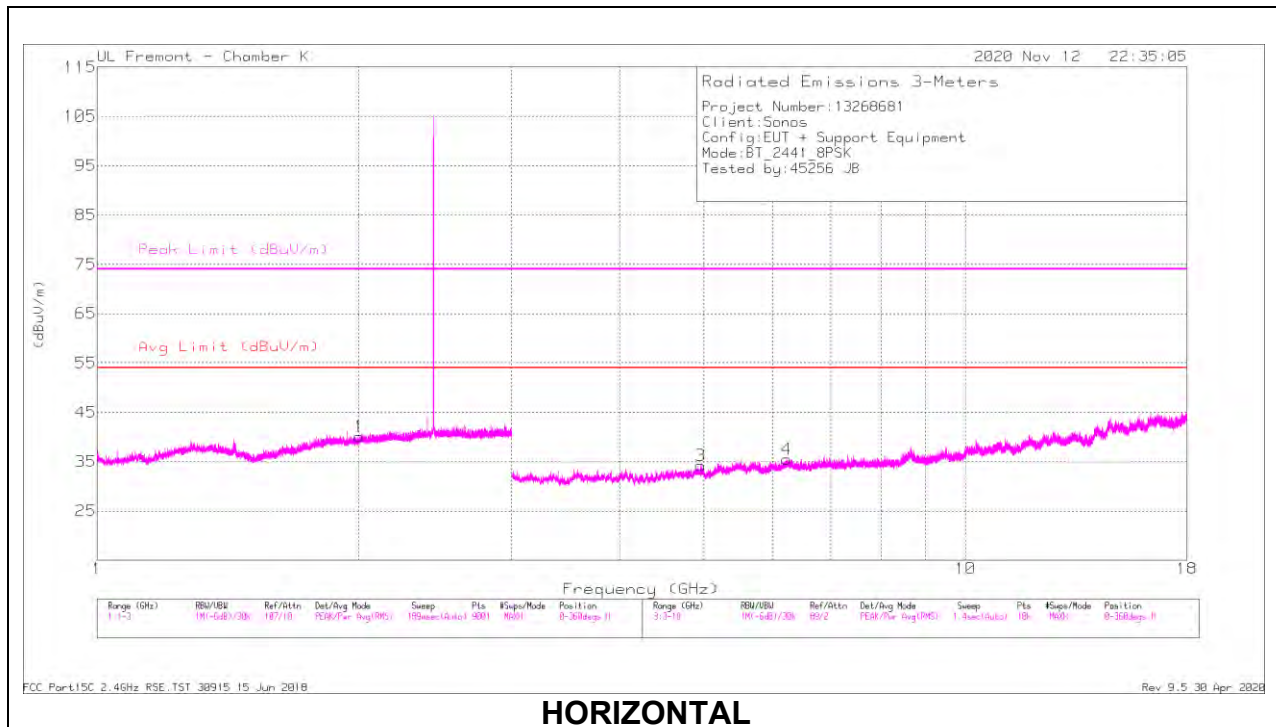
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.05111	44.05	Pk	31.4	-35.8	39.65	-	-	-	-	0-360	200	H
2	2.13711	44.51	Pk	31.7	-35.8	40.41	-	-	-	-	0-360	100	V
3	* 4.9518	48.38	PKFH	34.3	-40.7	41.98	-	-	74	-32.02	323	340	H
	* 4.95236	35.2	VA1T	34.3	-40.7	28.8	54	-25.2	-	-	323	340	H
4	6.40102	39.43	Pk	35.8	-39.4	35.83	-	-	-	-	0-360	200	H
5	* 4.97923	47.14	PKFH	34.3	-40.6	40.84	-	-	74	-33.16	6	236	V
	* 4.97847	35.06	VA1T	34.3	-40.6	28.76	54	-25.24	-	-	6	236	V
6	6.43353	38.43	Pk	35.8	-39.4	34.83	-	-	-	-	0-360	100	V

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

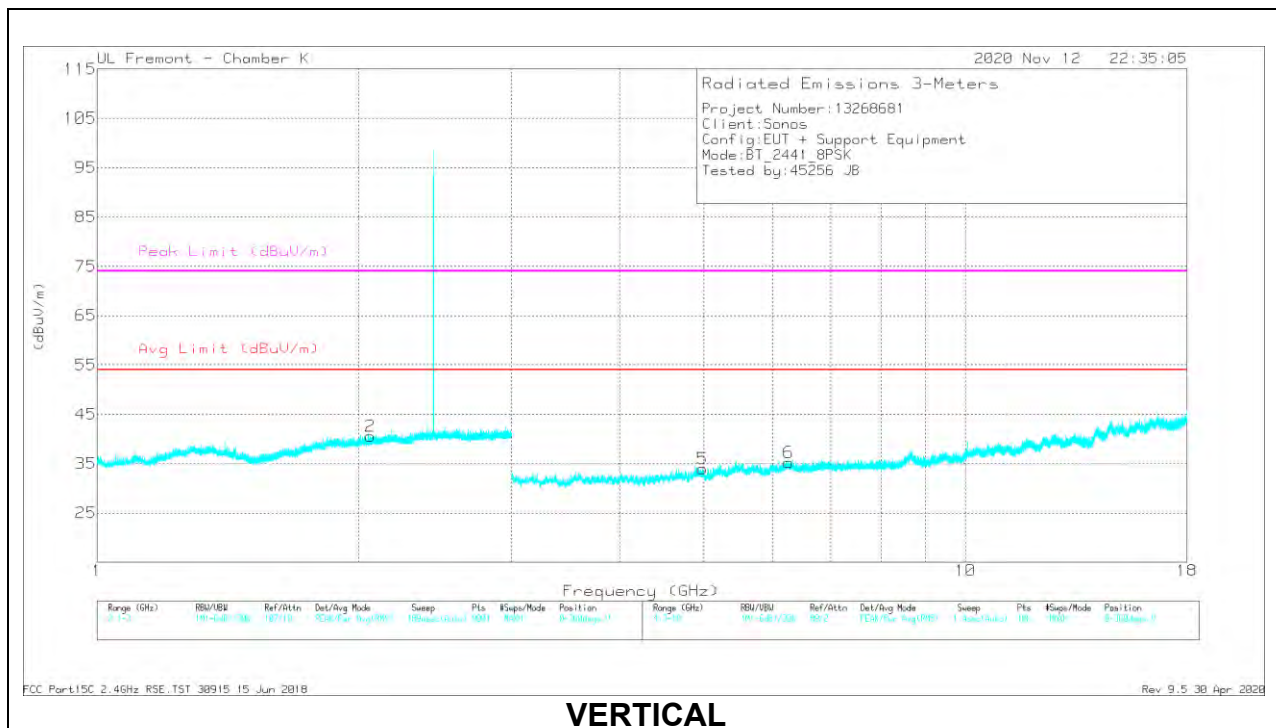
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

MID CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

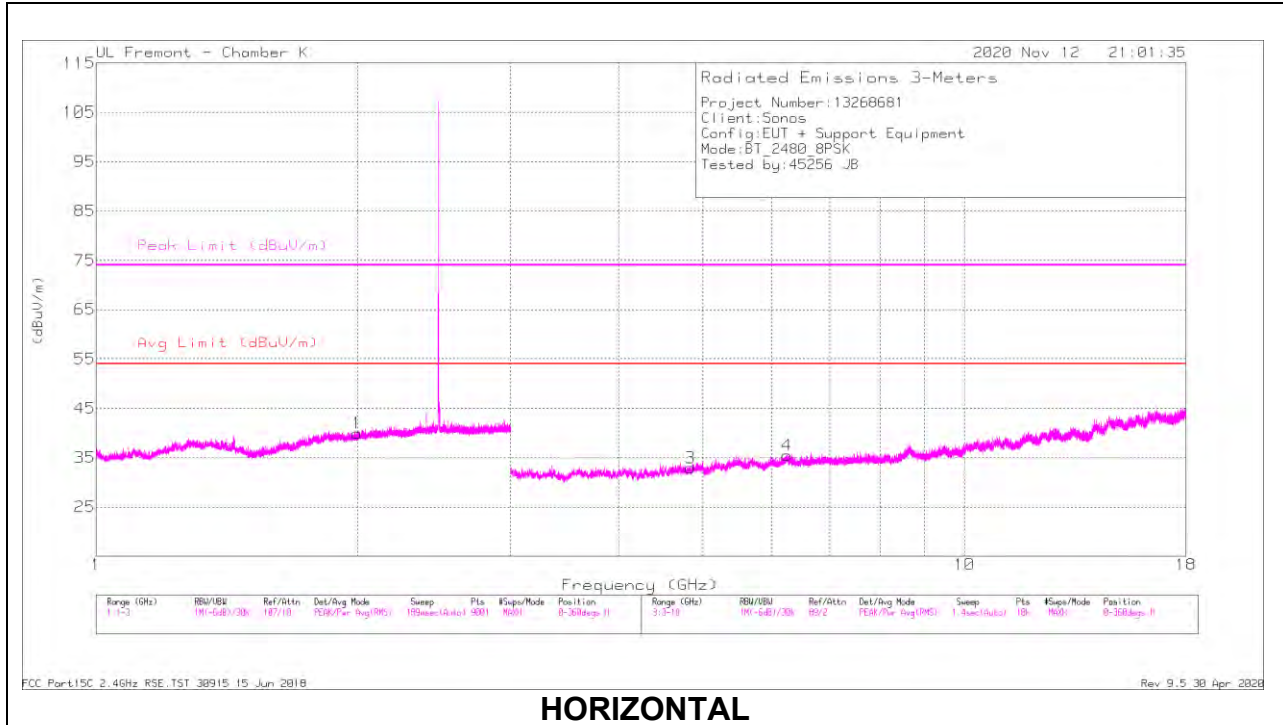
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	2.00467	44.69	Pk	31.3	-35.9	40.09	-	-	-	-	0-360	100	H
2	2.06355	44.96	Pk	31.5	-35.9	40.56	-	-	-	-	0-360	200	V
3	* 4.95879	47.37	PKFH	34.3	-40.6	41.07	-	-	74	-32.93	71	101	H
	* 4.95622	35.04	VA1T	34.3	-40.7	28.64	54	-25.36	-	-	71	101	H
4	6.22935	38.48	Pk	35.7	-38.7	35.48	-	-	-	-	0-360	100	H
5	* 4.98459	47.44	PKFH	34.4	-40.5	41.34	-	-	74	-32.66	213	115	V
	* 4.98102	35.06	VA1T	34.3	-40.5	28.86	54	-25.14	-	-	213	115	V
6	6.25518	38.27	Pk	35.8	-38.8	35.27	-	-	-	-	0-360	200	V

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

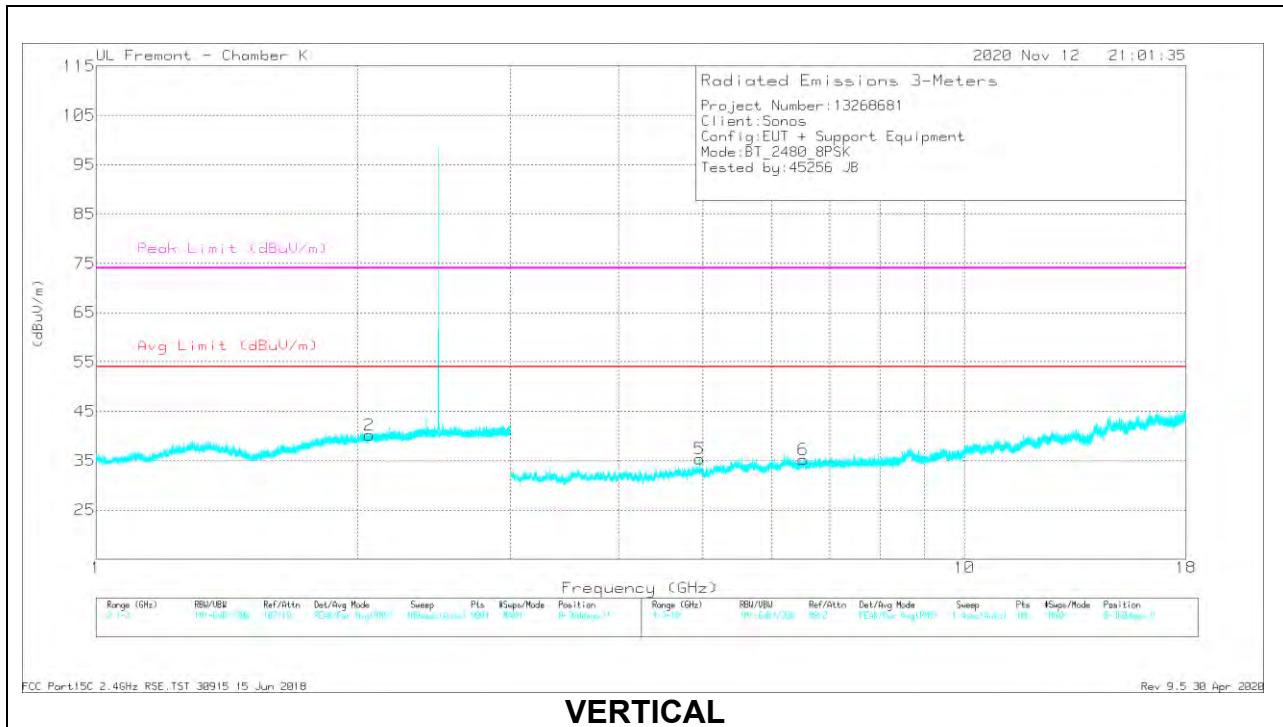
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

HIGH CHANNEL RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/P ad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.99844	44.78	Pk	31.1	-35.9	39.98	-	-	-	-	0-360	200	H
2	2.06444	44.62	Pk	31.5	-35.9	40.22	-	-	-	-	0-360	200	V
3	* 4.83359	47.44	PKFH	34.4	-40.6	41.24	-	-	74	-32.76	144	97	H
	* 4.83567	34.51	VA1T	34.4	-40.6	28.31	54	-25.69	-	-	144	97	H
4	6.25352	38.46	Pk	35.8	-38.8	35.46	-	-	-	-	0-360	100	H
5	* 4.95991	48.92	PKFH	34.3	-40.7	42.52	-	-	74	-31.48	165	168	V
	* 4.95981	37.53	VA1T	34.3	-40.7	31.13	54	-22.87	-	-	165	168	V
6	6.5277	38.63	Pk	35.8	-39.2	35.23	-	-	-	-	0-360	100	V

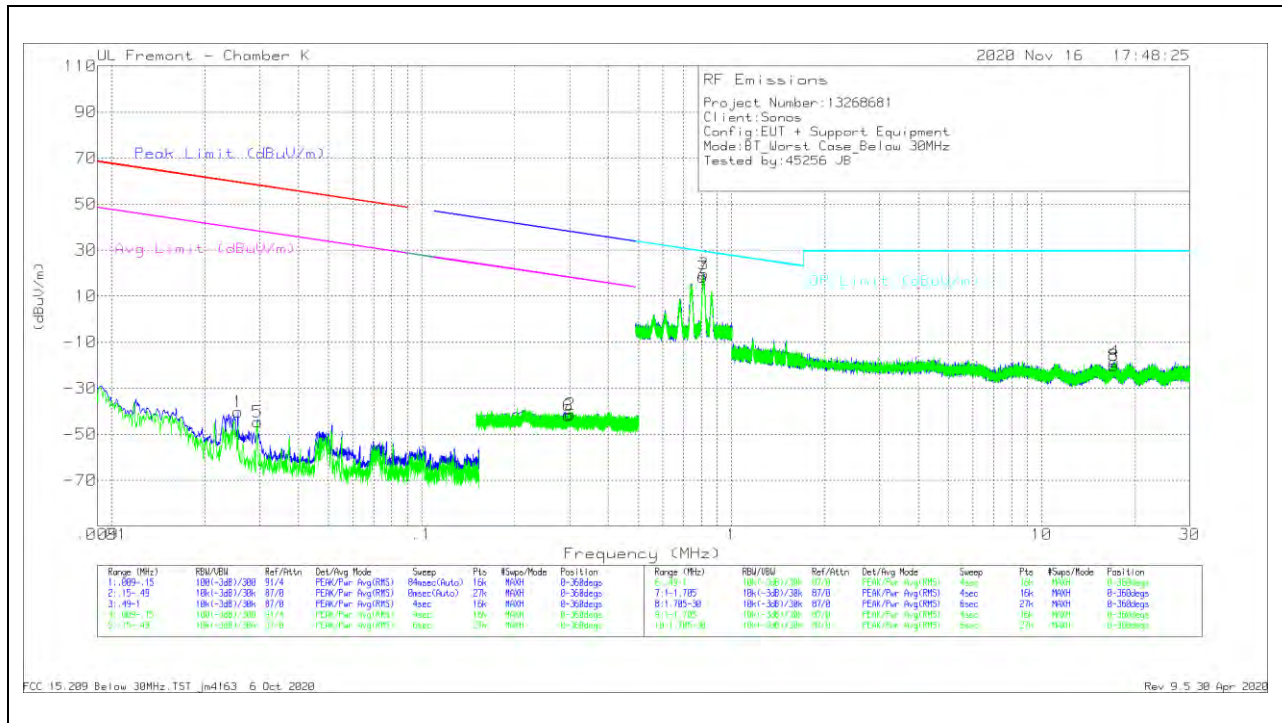
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

10.2. WORST CASE BELOW 30MHZ

SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



Below 30MHz Data

Marker	Frequency	Meter	Det	Loop Antenna (E ACF)	Amp/Cbl (dB)	Dist Corr 300m	Corrected	Peak Limit (dBuV/m)	Margin	Avg Limit (dBuV/m)	Margin	Peak Limit (dBuV/m)	Margin	Avg Limit (dBuV/m)	Margin	Azimuth
1	0.0256	13.64	Pk	58.2	-32.1	-80	-40.26	59.42	-99.68	39.42	-79.68	-	-	-	-	0-360
2	0.30246	14.81	Pk	55.9	-32.2	-80	-41.49	-	-	-	-	38	-79.49	18	-59.49	0-360
5	0.02955	9.78	Pk	57.7	-32.2	-80	-44.72	58.17	-102.89	38.17	-82.89	-	-	-	-	0-360
6	0.29788	14.41	Pk	55.9	-32.2	-80	-41.89	-	-	-	-	38.13	-80.02	18.13	-60.02	0-360

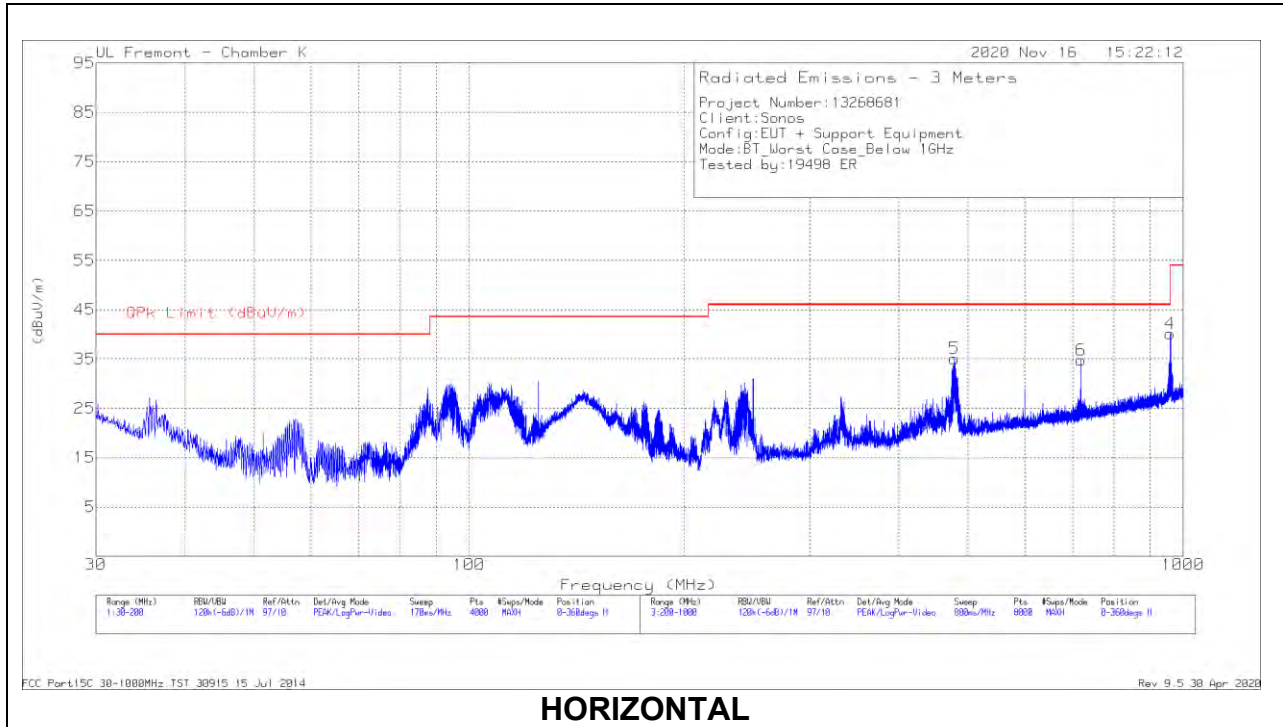
PK - Peak detector

Marker	Frequency	Meter	Det	Loop Antenna (E ACF)	Amp/Cbl (dB)	Dist Corr 30m (dB) 40Log	Corrected	QP Limit (dBuV/m)	Margin	Azimuth
3	0.81166	35.81	Pk	56	-32.2	-40	19.61	29.43	-9.82	0-360
7	0.80802	34.51	Pk	56	-32.2	-40	18.31	29.47	-11.16	0-360
4	17.14414	18.64	Pk	34.5	-31.7	-40	-18.56	29.5	-48.06	0-360
8	17.07392	16.96	Pk	34.5	-31.7	-40	-20.24	29.5	-49.74	0-360

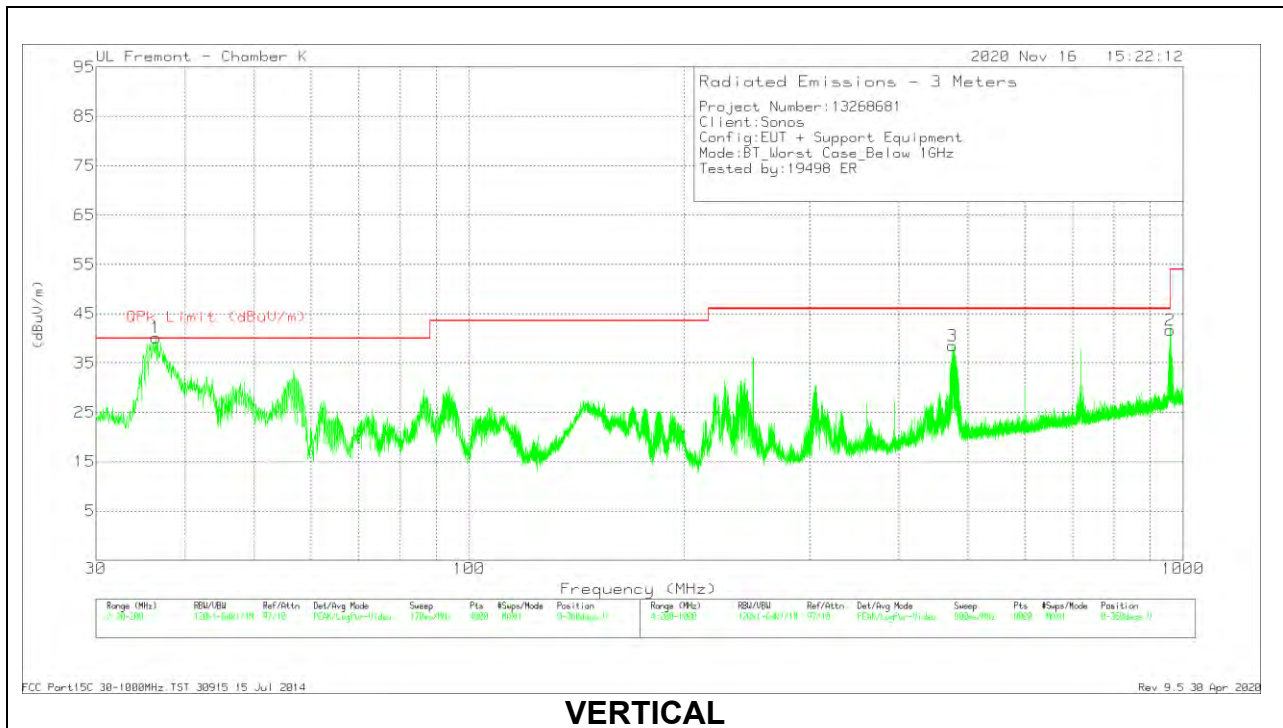
PK - Peak detector

10.3. 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 81560 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	36.4192	48.59	Pk	23.1	-31.5	40.19	40	.19	0-360	100	V
	36.0596	46.31	Qp	23.4	-31.5	38.21	40	-1.79	300	100	V
4	959.9988	37.21	Pk	29.3	-26.4	40.11	46.02	-5.91	0-360	200	H
	960.0199	38.73	Qp	29.3	-26.4	41.63	53.97	-12.34	50	265	H
5	477.8361	40.52	Pk	23.8	-29.2	35.12	46.02	-10.9	0-360	200	H
6	719.9676	36.65	Pk	26.8	-28.6	34.85	46.02	-11.17	0-360	100	H
2	959.9988	38.79	Pk	29.3	-26.4	41.69	46.02	-4.33	0-360	100	V
	960.0151	42.19	Qp	29.3	-26.4	45.09	53.97	-8.88	177	95	V
3	475.6358	43.87	Pk	23.8	-29.2	38.47	46.02	-7.55	0-360	100	V

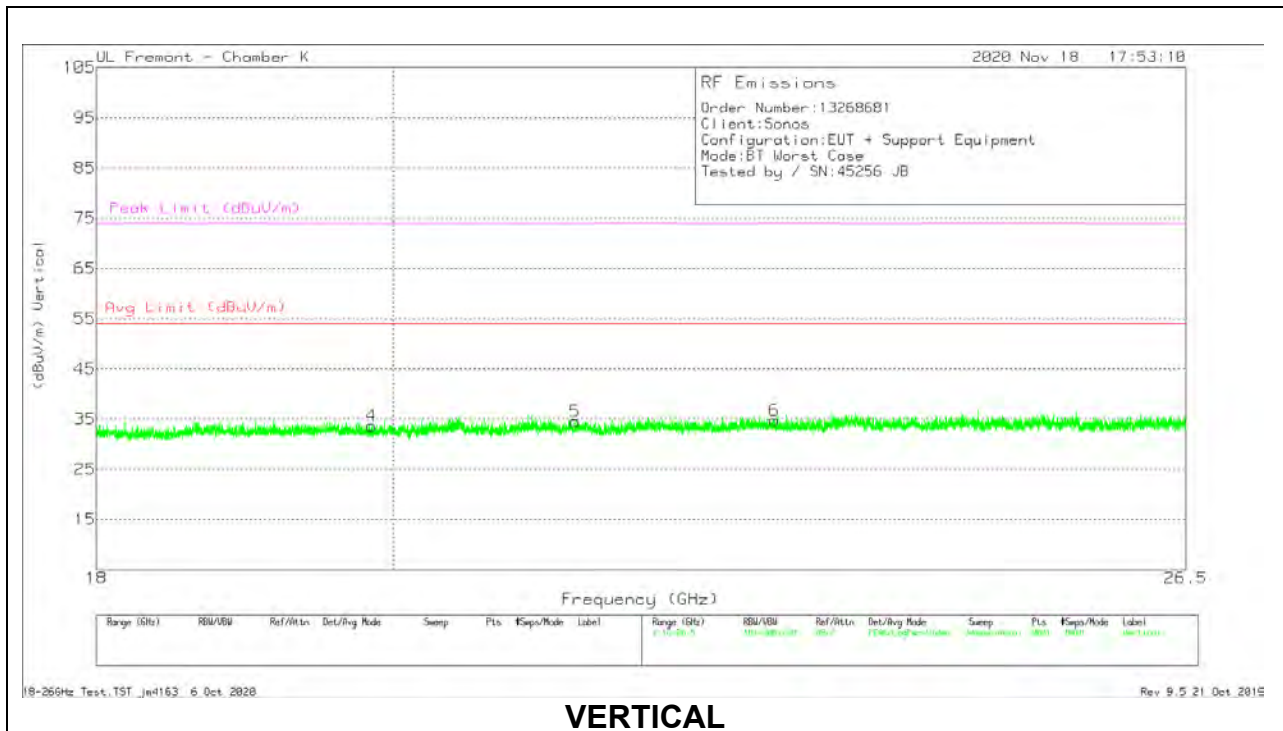
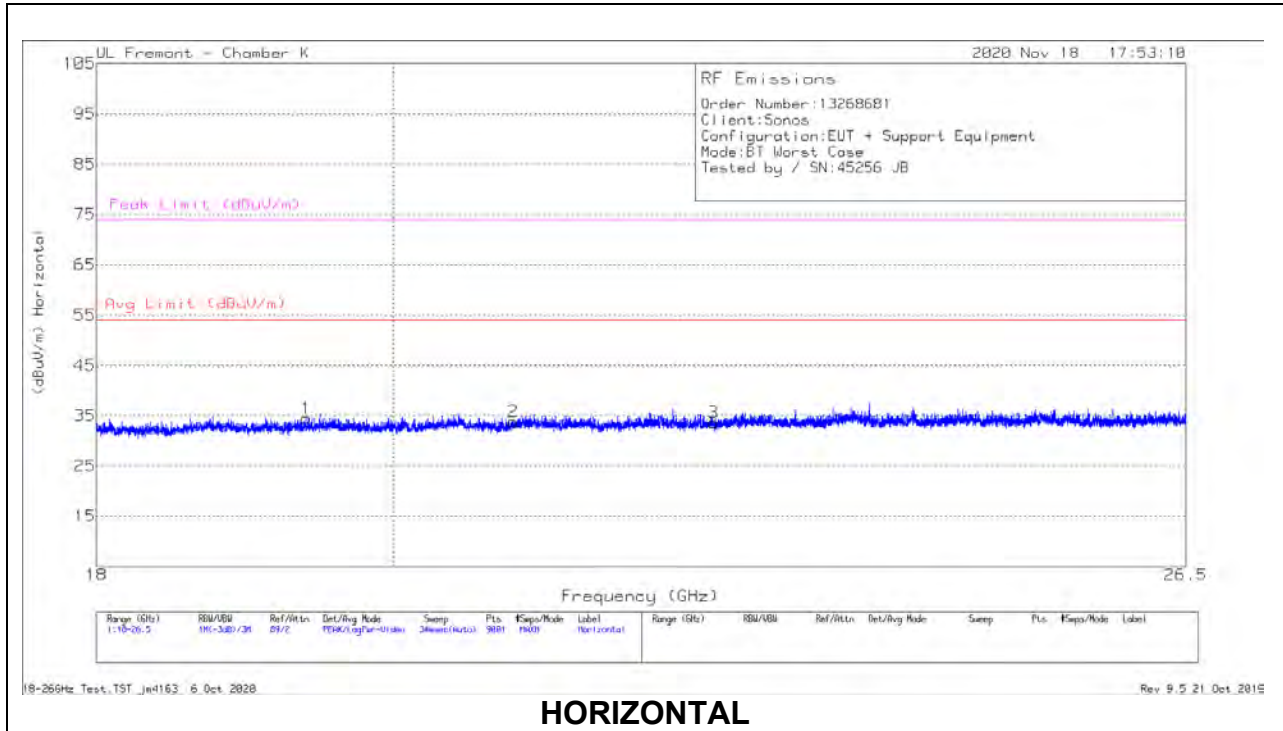
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Qp - Quasi-Peak detector

10.4. WORST CASE 18-26 GHZ

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



18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T447 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.39117	68.17	Pk	32.7	-56.9	-9.5	34.47	54	-19.53	74	-39.53
2	20.87017	67.23	Pk	33.2	-57.1	-9.5	33.83	54	-20.17	74	-40.17
3	22.40866	67.21	Pk	33.6	-57.7	-9.5	33.61	54	-20.39	74	-40.39
4	19.84733	67.45	Pk	32.8	-57.1	-9.5	33.65	54	-20.35	74	-40.35
5	21.33389	68.21	Pk	33.1	-57.3	-9.5	34.51	54	-19.49	74	-39.49
6	22.89789	67.97	Pk	33.7	-57.4	-9.5	34.77	54	-19.23	74	-39.23

Pk - Peak detector

11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

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

*Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

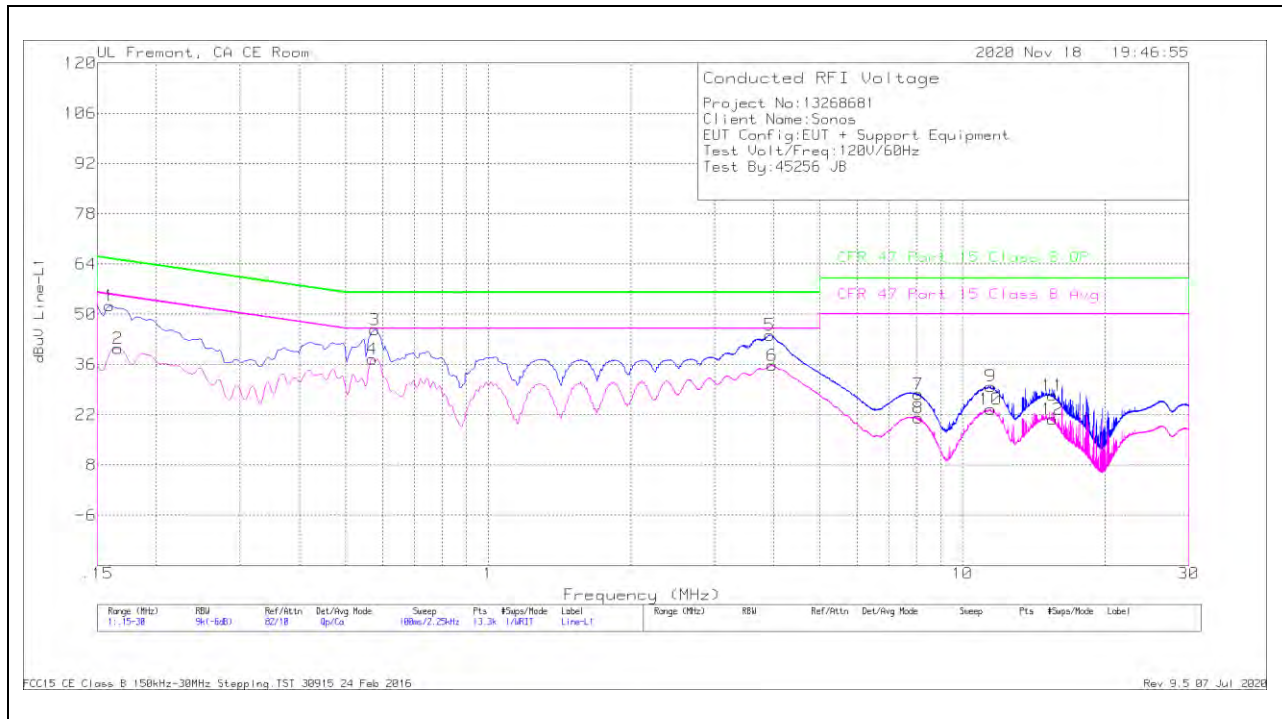
The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

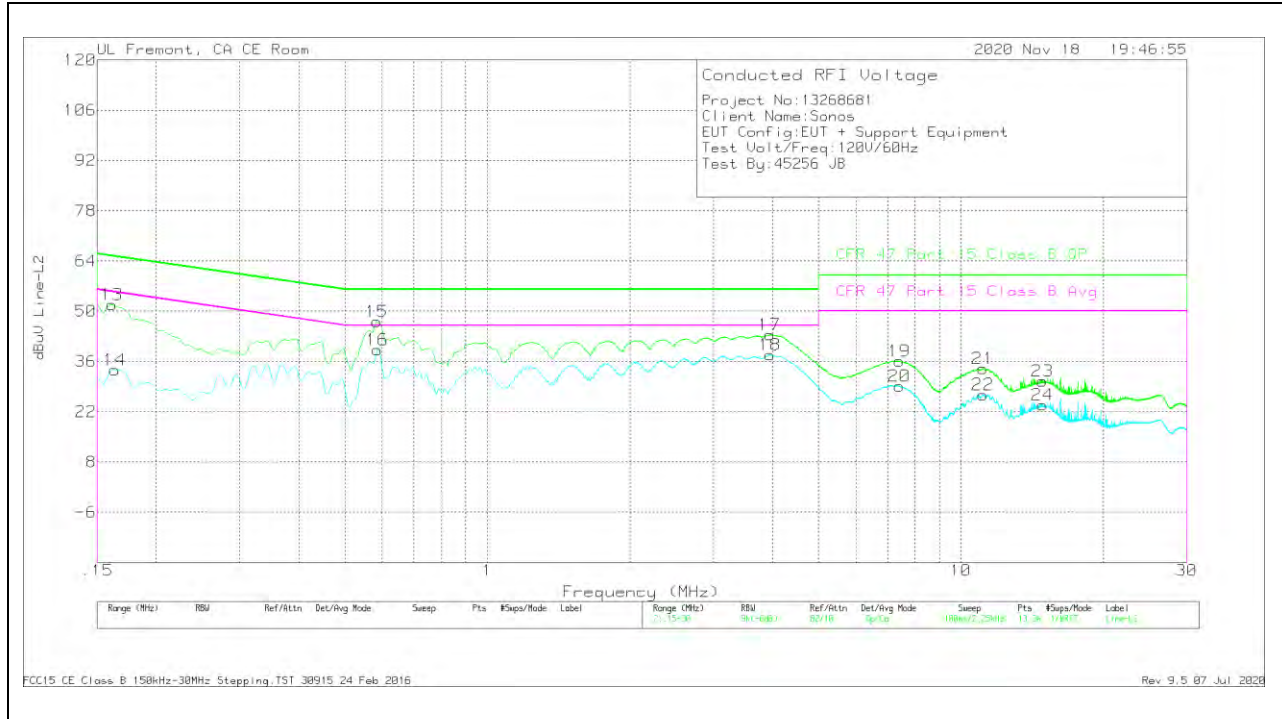
11.1.1. AC Power Line

LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L1	LC Cables C1&C3 dB	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	.159	42.13	Qp	.1	0	10.1	52.33	65.52	-13.19	-	-
2	.16575	30.4	Ca	0	0	10.1	40.5	-	-	55.17	-14.67
3	.5775	35.56	Qp	0	0	10.1	45.66	56	-10.34	-	-
4	.56963	27.46	Ca	0	0	10.1	37.56	-	-	46	-8.44
5	3.92775	33.93	Qp	0	.1	10.2	44.23	56	-11.77	-	-
6	3.97275	25.51	Ca	0	.1	10.2	35.81	-	-	46	-10.19
7	8.061	17.49	Qp	0	.1	10.2	27.79	60	-32.21	-	-
8	8.061	10.85	Ca	0	.1	10.2	21.15	-	-	50	-28.85
9	11.46525	19.43	Qp	.1	.2	10.2	29.93	60	-30.07	-	-
10	11.46525	13.07	Ca	.1	.2	10.2	23.57	-	-	50	-26.43
11	15.46575	16.93	Qp	0	.2	10.3	27.43	60	-32.57	-	-
12	15.4635	10.23	Ca	0	.2	10.3	20.73	-	-	50	-29.27

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz											
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	PRE018644 6 LISN L2	LC Cables C2&C3 dB	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	.16125	41.78	Qp	0	0	10.1	51.88	65.4	-13.52	-	-
14	.1635	23.57	Ca	0	0	10.1	33.67	-	-	55.28	-21.61
15	.58425	37.08	Qp	0	0	10.1	47.18	56	-8.82	-	-
16	.5865	29.19	Ca	0	0	10.1	39.29	-	-	46	-6.71
17	3.9435	33.16	Qp	0	.1	10.2	43.46	56	-12.54	-	-
18	3.948	27.59	Ca	0	.1	10.2	37.89	-	-	46	-8.11
19	7.41975	25.76	Qp	0	.1	10.2	36.06	60	-23.94	-	-
20	7.4175	18.78	Ca	0	.1	10.2	29.08	-	-	50	-20.92
21	11.11875	23.69	Qp	0	.2	10.2	34.09	60	-25.91	-	-
22	11.121	16.38	Ca	0	.2	10.2	26.78	-	-	50	-23.22
23	14.88525	19.92	Qp	.1	.2	10.3	30.52	60	-29.48	-	-
24	14.88525	13.25	Ca	.1	.2	10.3	23.85	-	-	50	-26.15