



# **TEST REPORT**

**Report Number. :** 13079833-E18V3

**Applicant :** SRAM LLC  
1000 W Fulton Market 4<sup>th</sup> Floor  
Chicago, IL 60607, United States

**Model :** 00120

**FCC ID :** C9O-RSBB2

**ISED :** 10161A-RSBB2

**EUT Description :** Right Shifter with AIREA and BLE Radios

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

**Date Of Issue:**

October 01, 2020

**Prepared by:**

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NVLAP Lab code: 200065-0

## REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	4/15/2020	Initial Issue	
V2	09/28/2020	Updated Section 7	Steven Tran
V3	10/1/2020	Updated Section 9.3	Steven Tran

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** SRAM LLC  
1000 W Fulton Market 4<sup>th</sup> Floor  
Chicago, IL 60607, United States

**EUT DESCRIPTION:** Right Shifter with AIREA and BLE Radios

**MODEL:** 00120

**SERIAL NUMBER:** Radiated: 1634040102  
Conducted:1634040003

**DATE TESTED:** JANUARY 19, 2020 – FEBRUARY 04, 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 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.

## 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
<input type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D	<input checked="" type="checkbox"/> Chamber I
<input type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E	<input checked="" type="checkbox"/> Chamber J
<input type="checkbox"/> Chamber C	<input type="checkbox"/> Chamber F	<input type="checkbox"/> Chamber K
	<input type="checkbox"/> Chamber G	<input type="checkbox"/> Chamber L
	<input type="checkbox"/> Chamber H	<input type="checkbox"/> Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code: 2324A.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0

## 4. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 4.1. METROLOGICAL TRACEABILITY

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. 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.)

### 4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U <sub>Lab</sub>
Conducted Disturbance, 9KHz to 0.15 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	2.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

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

## 5. EQUIPMENT UNDER TEST

### 5.1. EUT DESCRIPTION

The EUT is a Right Shifter with AIREA and BLE Radios, powered by CR2032, a coin cell battery.

### 5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Mode	Peak		Average	
		Output Power (dBm)	Output Power (mW)	Output Power (dBm)	Output Power (mW)
2402 - 2480	BLE	3.80	2.40	3.66	2.32



### **5.3. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes a Nordic Semiconductor nRF52840 microcontroller chip antenna, with maximum gain of 2.2dBi.

### **5.4. SOFTWARE AND FIRMWARE**

The EUT firmware installed during testing was B-1.0.

The test utility software used during testing was nRF Connect version 3.3.0

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## 5.5. WORST-CASE CONFIGURATION AND MODE

Radiated emissions below 1GHz and above 18GHz 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 orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

Worst-case data rate as provided by the client was 1Mbps.

Conducted test data is leveraged from test report 13079833-E1 FCCISED Report BLE (Left Shifter). SRAM LLC declares the that the only differences between the two devices (Left Shifter 00020) and Right Shifter (00120):

### 1. F/W:

the firmware is identical except for:

- pin assignment due to mirror image of left and right PCBAs
- identifier in COM after the components are paired into a system

### 2. H/W:

Looking at the schematic, left and right PCBAs look identical except for

- due to mirror image of left and right PCBAs, the microcontroller has different pin assignments
- due to different pin assignment of the micro, some of the trace layouts may vary, but due to the PCBAs being so small, the different is in millimeters or less

Therefore, conducted test data from the Left Shifter (00020) represents the conducted test data for the Right Shifter (00120) in this test report.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
Laptop	Lenovo	T450s	PC044FTD
AC/DC Adapter	Lenovo	ADLX45NCC2A	N/A
USB Dongle	Segger	E204460	680435024
DC Power Supply	Kenwood Corporation	PA36-3A	7060074

### I/O CABLES (CONDUCTED EMISSIONS)

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Unshielded	1.5	AC Main to DC Supply, to Analyzer
2	DC	1	DC	Unshielded	0.5	Power Supply to EUT
3	Antenna Port	1	SMA	Unshielded	0.5	EUT to Analyzer

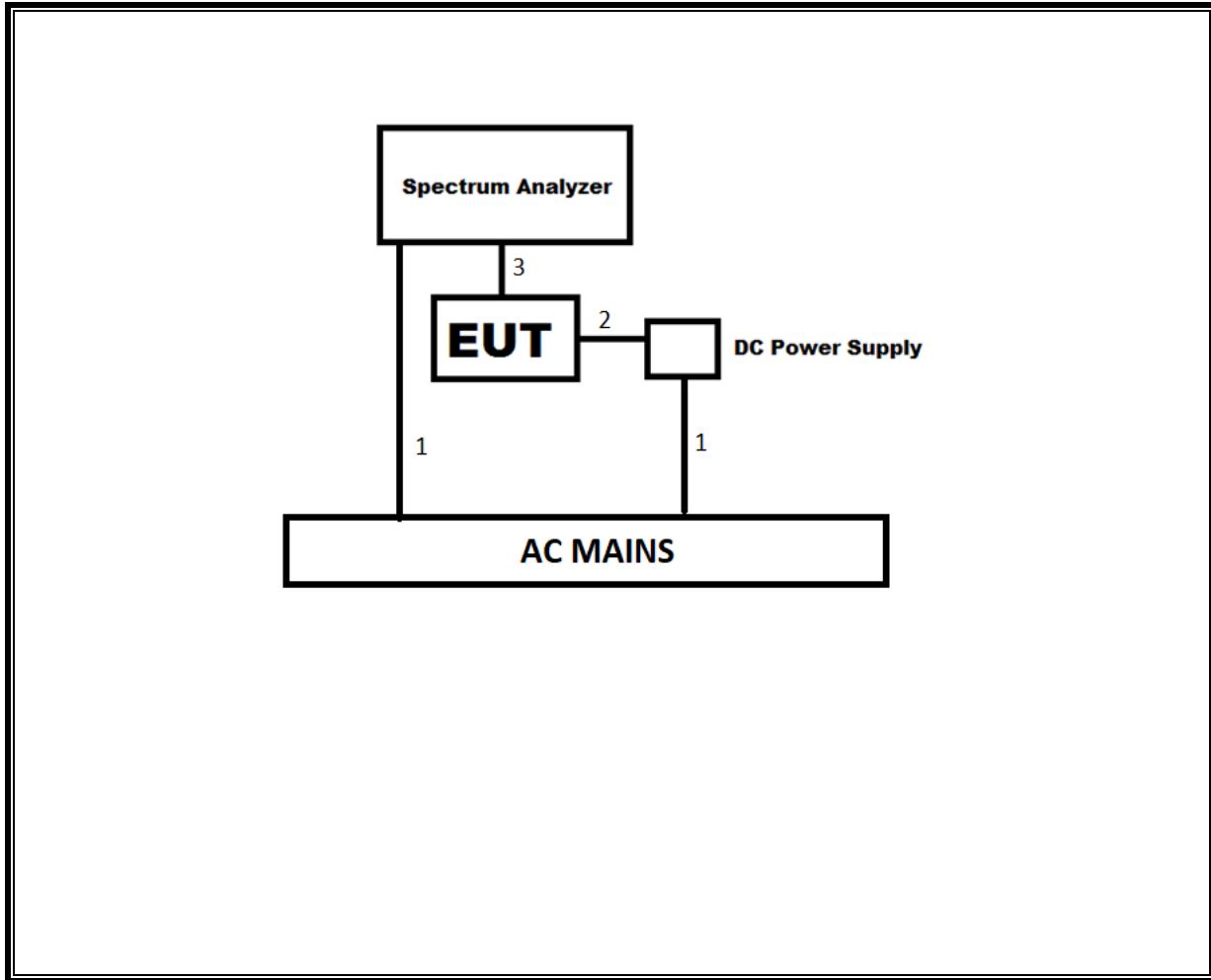
### I/O CABLES (RADIATED EMISSIONS)

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC	1	AC	Unshielded	1.5	AC Main to DC Supply
2	DC	1	DC	Unshielded	0.5	Power Supply to EUT

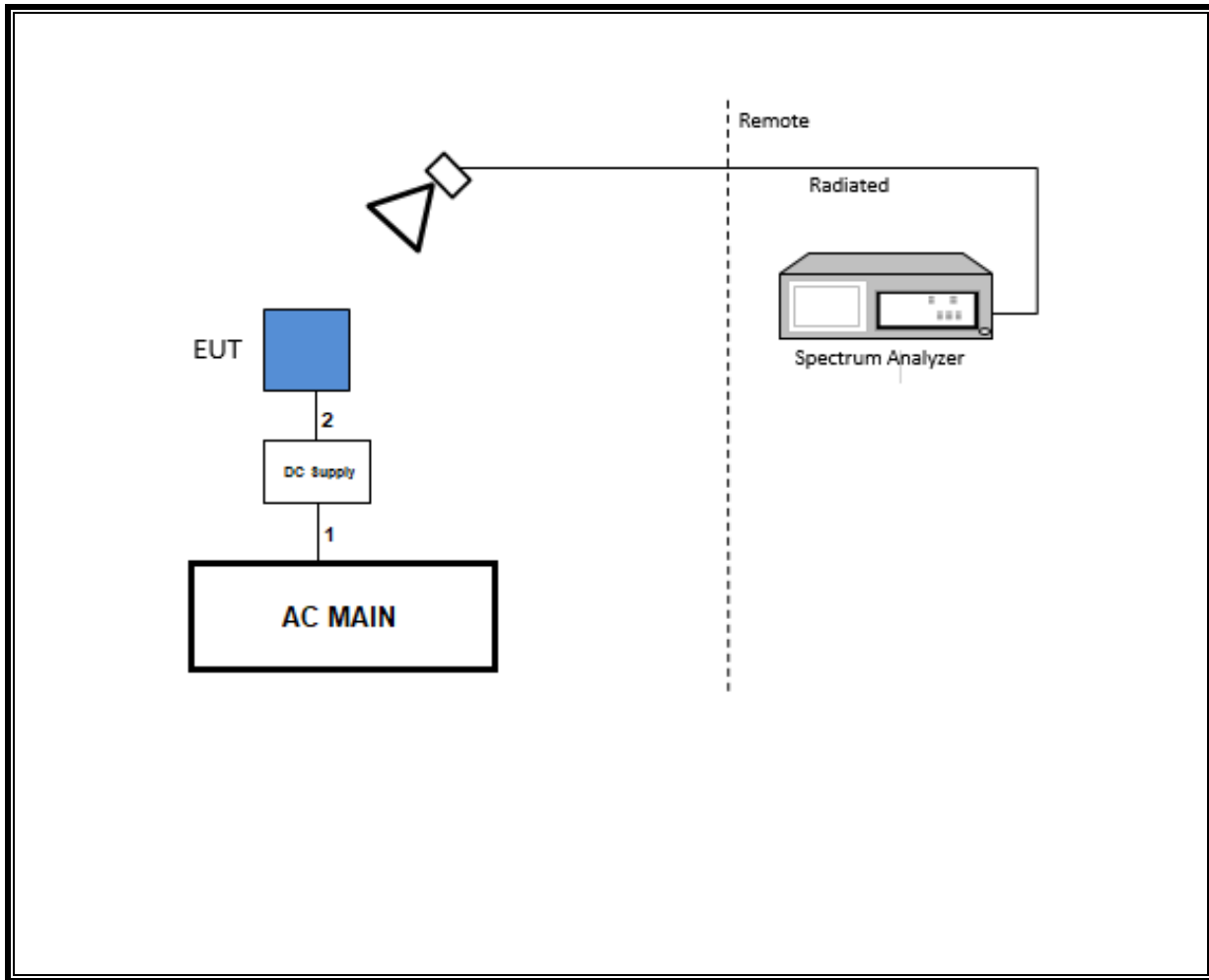
### TEST SETUP

For the purposes of testing, the EUT was powered by a 3V DC Power supply. The EUT is normally powered by a CR2032 coin cell battery.

**SETUP DIAGRAM FOR CONDUCTED TESTS**



**SETUP DIAGRAM FOR RADIATED TESTS**



## 6. MEASUREMENT METHOD

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

6 dB BW: ANSI C63.10 Section -11.8.1       $RBW \geq DTS \text{ BW}$

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

Output Power: ANSI C63.10 Section -11.9.1.3      Method PKPM1 Peak-reading power meter

Output Power: ANSI C63.10 Section -11.9.2.3.2      Method AVGPM-G (Measurement using a gated RF average-reading power meter)

PSD: ANSI C63.10 Section -11.10.2 Method PKPSD (peak PSD)

Radiated emissions non-restricted frequency bands: ANSI C63.10 Section -11.11

Radiated emissions restricted frequency bands: ANSI C63.10 Section -11.12.1

Conducted emissions in restricted frequency bands: ANSI C63.10 Section -11.12.2

Band-edge: ANSI C63.10 Section - 6.10

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

## 7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

<b>TEST EQUIPMENT LIST</b>				
<b>Description</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Asset</b>	<b>Cal Due</b>
Antenna, Passive Loop 30Hz - 1MHz	ELECTRO METRICS	EM-6871	PRE0179466	05/31/2020
Antenna, Passive Loop 100KHz - 30MHz	ELECTRO METRICS	EM-6872	PRE0179468	05/31/2020
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T344	05/07/2020
Amplifier, 1 to 18GHz, 35dB	AMPLICAL	AMP1G18-35	T1571	05/28/2020
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB3	T899	08/23/2020
Amplifier, 9KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0180174	06/01/2020
EMI TEST RECEIVER	Rohde & Schwarz	ESW44	PRE0179372	02/16/2020
Antenna Horn, 18 to 26.5GHz	ARA	MWH-1826/B	T447	08/13/2020
Pre-Amp 1-26.5 GHz	AMPLICAL	AMP18G26.5-60	PRE0181238	05/01/2020
Spectrum Analyzer, PSA, 3Hz to 44GHz	Agilent (Keysight) Technologies	E4446A	T146	01/28/2020
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1269	01/21/2021
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T413	02/22/2020
<b>UL AUTOMATION SOFTWARE</b>				
Radiated Software	UL	UL EMC	Ver 9.5, Sep 24, 2019	
Antenna Port Software	UL	UL RF	Ver 2020.1.8	

## 8. ANTENNA PORT TEST RESULTS

### 8.1. ON TIME AND DUTY CYCLE

#### LIMITS

None; for reporting purposes only.

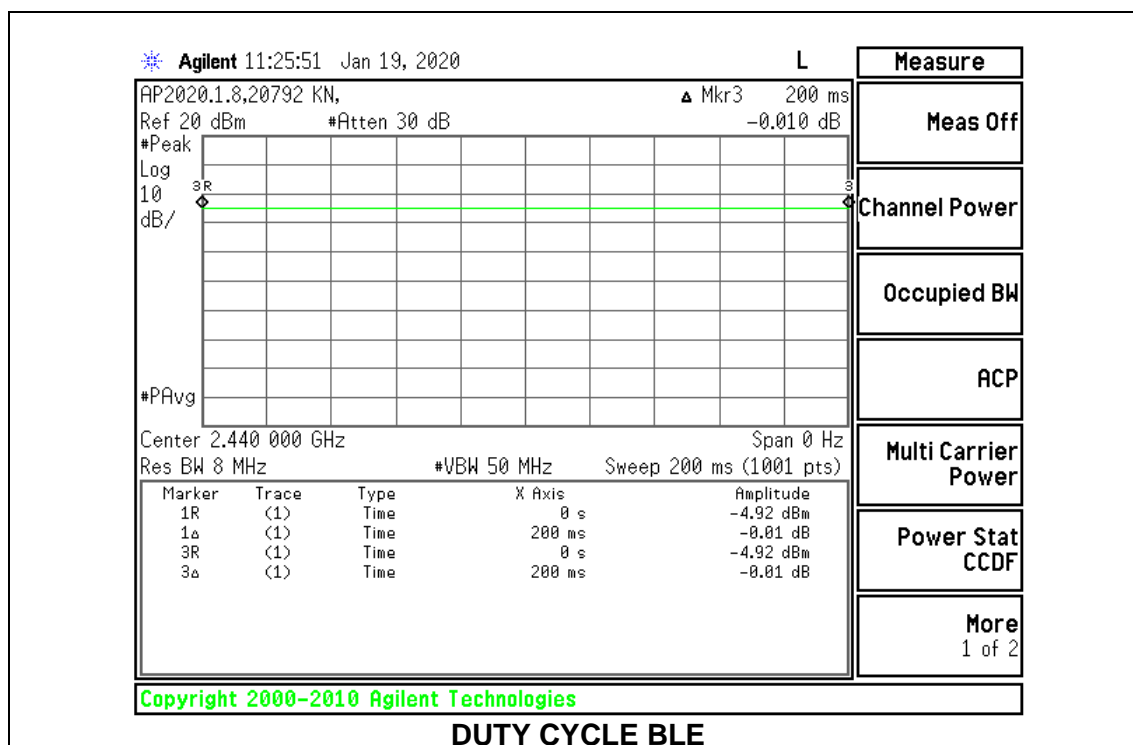
#### PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method.

#### ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
BLE	200	200	1.000	100	0.00	0.010

#### DUTY CYCLE PLOTS





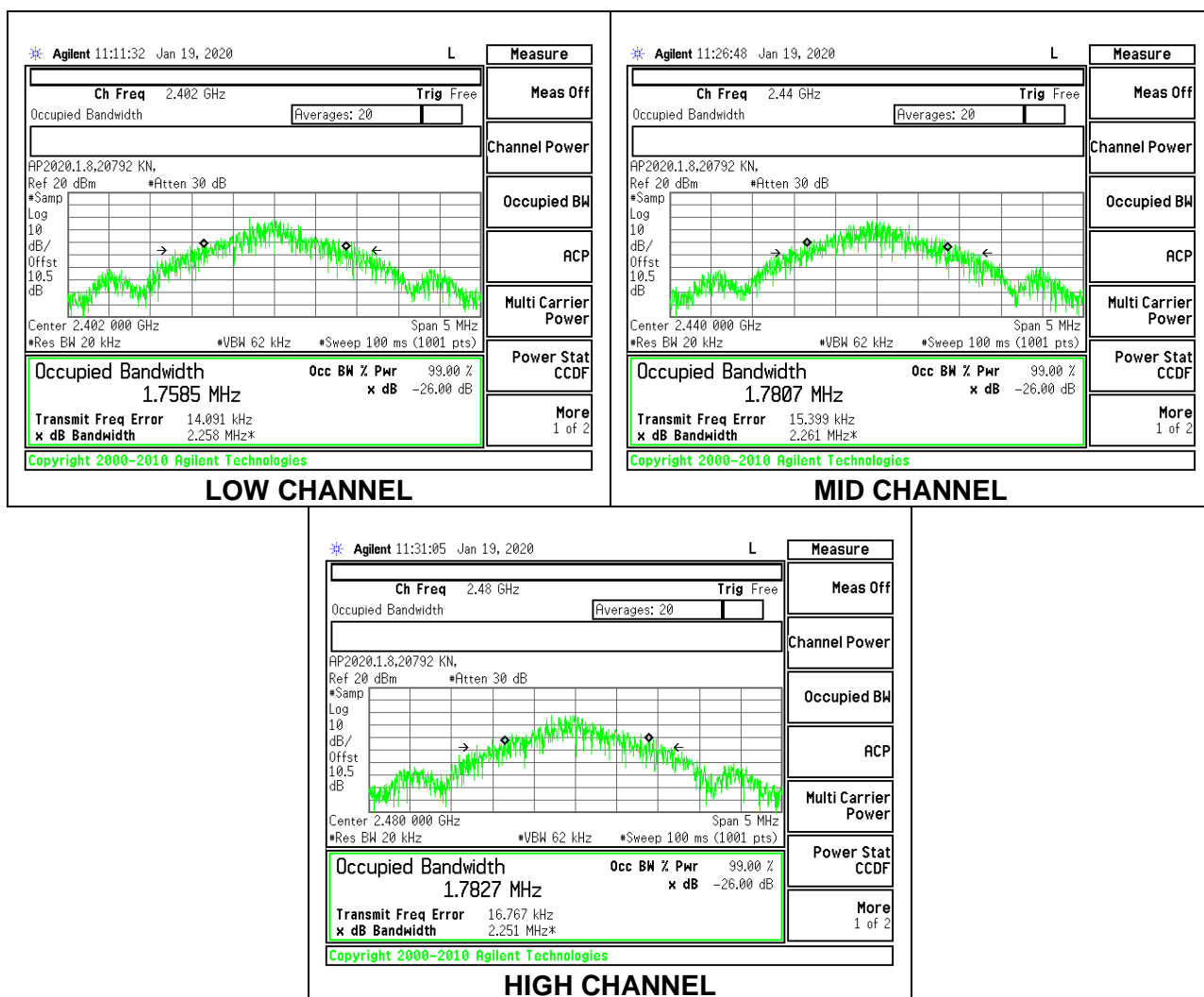
## 8.2. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.7585
Middle	2440	1.7807
High	2480	1.7827



### 8.3. 6 dB BANDWIDTH

#### LIMITS

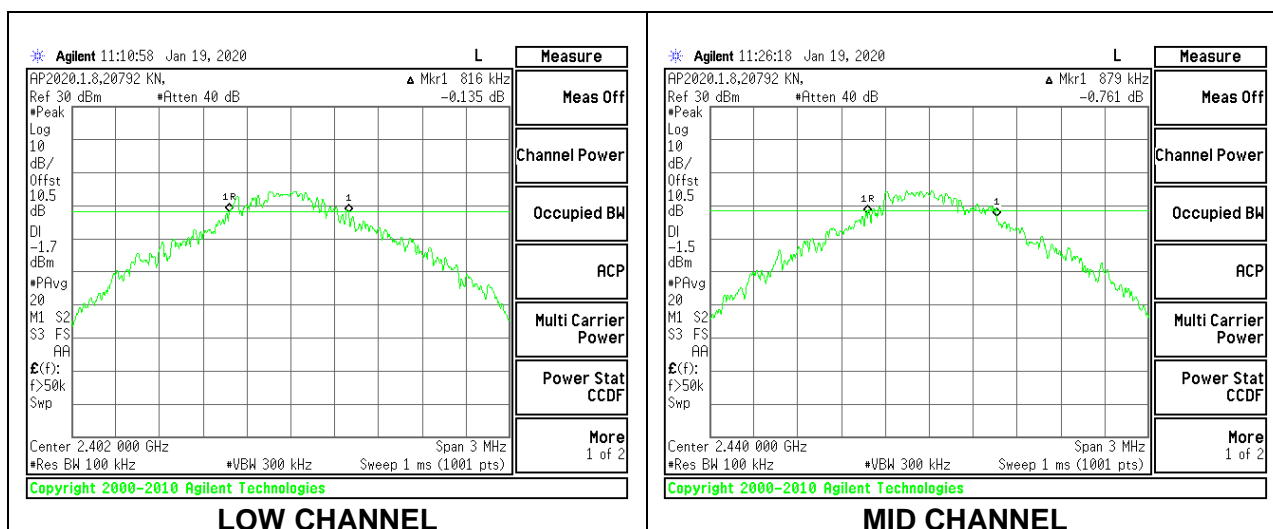
FCC §15.247 (a) (2)

RSS-247 5.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.816	0.5
Middle	2440	0.879	0.5
High	2480	0.786	0.5



## 8.4. OUTPUT POWER

### LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

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

### TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss was entered as an offset in the power meter to allow for a gated peak reading of power.

### RESULTS

<b>Tested By:</b>	16080ZS
<b>Date:</b>	1/29/2020

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Peak Power Reading (dBm)</b>	<b>Limit (dBm)</b>	<b>Margin (dB)</b>
Low	2402	3.80	30	-26.200
Middle	2440	3.78	30	-26.220
High	2480	3.54	30	-26.460

## 8.5. AVERAGE POWER

### LIMITS

None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a power meter.

The cable assembly insertion loss was entered as an offset in the power meter to allow for a gated average reading of power.

### RESULTS

<b>Tested By:</b>	16080ZS
<b>Date:</b>	1/29/2020

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>AV power (dBm)</b>
Low	2402	3.65
Middle	2440	3.66
High	2480	3.42

## 8.6. POWER SPECTRAL DENSITY

### LIMITS

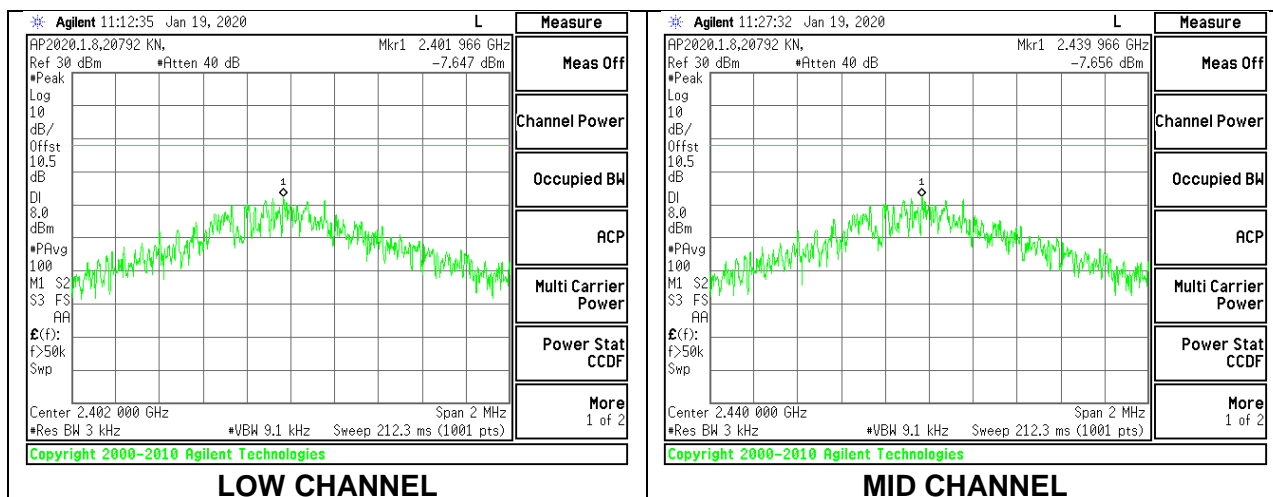
FCC §15.247 (e)

RSS-247 (5.2) (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

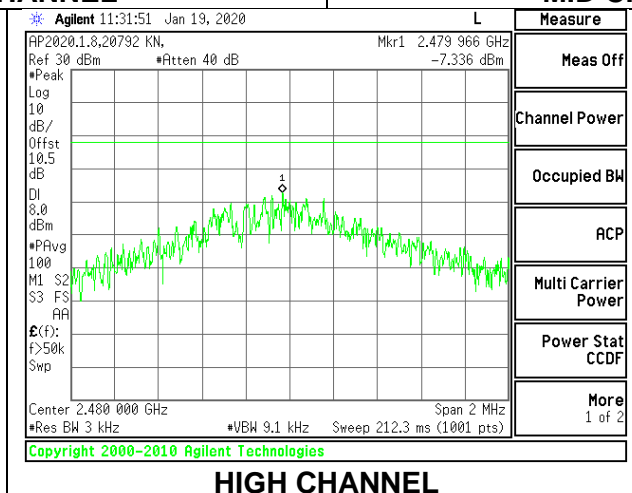
### RESULTS

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-7.647	8	-15.65
Middle	2440	-7.656	8	-15.66
High	2480	-7.336	8	-15.34



**LOW CHANNEL**

**MID CHANNEL**



**HIGH CHANNEL**

## **8.7. CONDUCTED SPURIOUS EMISSIONS**

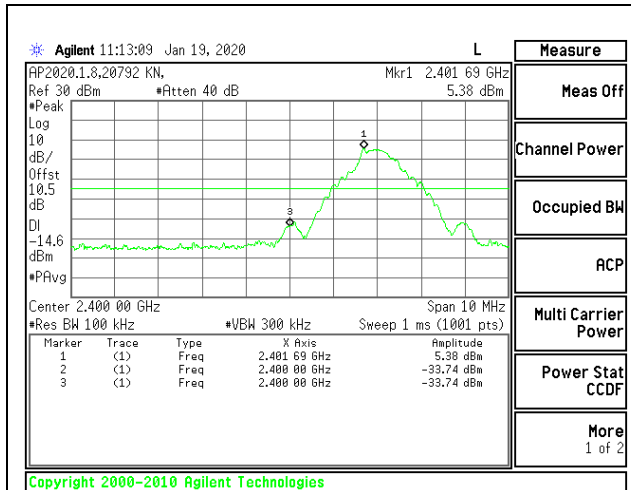
### **LIMITS**

FCC §15.247 (d)

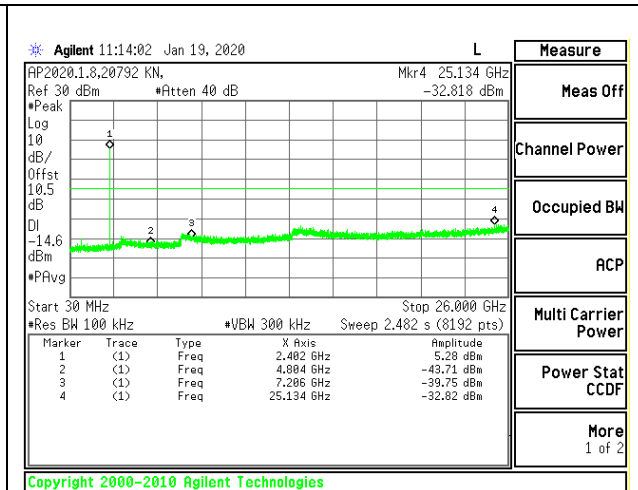
RSS-247 5.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

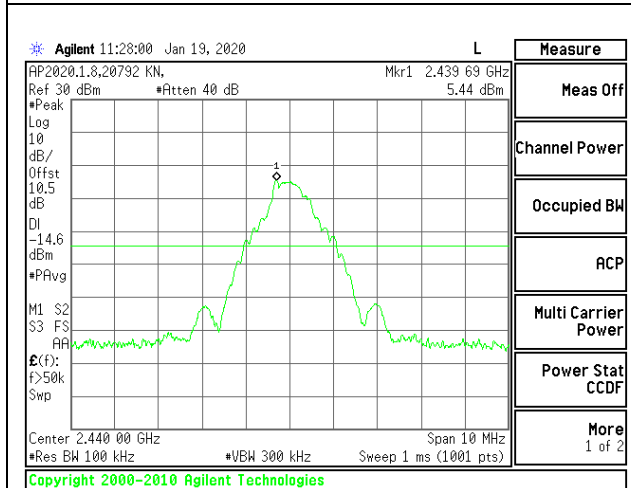
### **RESULTS**



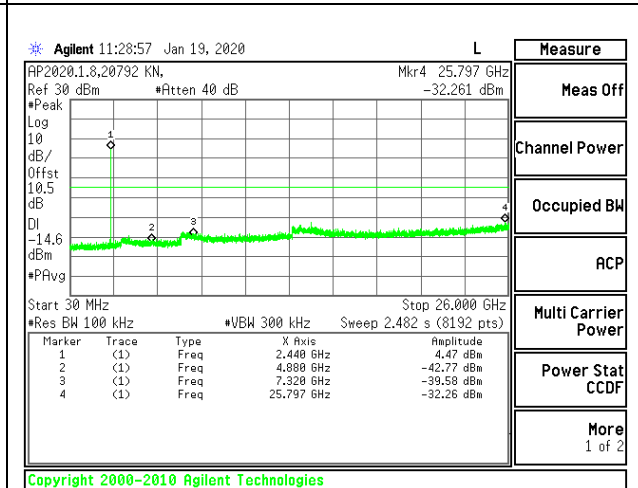
LOW CHANNEL BANDEDGE



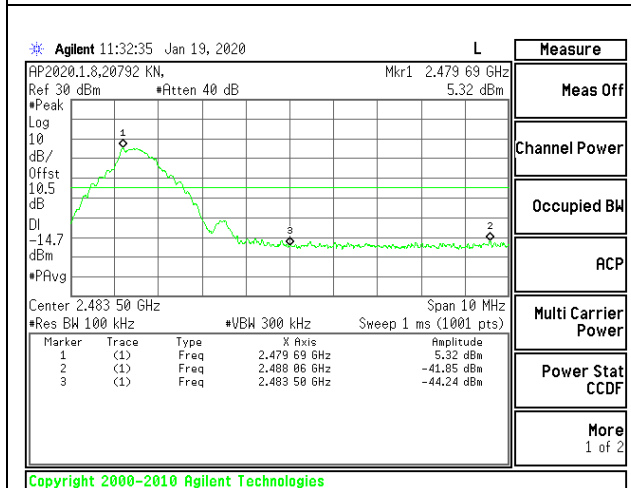
OUT-OF-BAND LOW CHANNEL



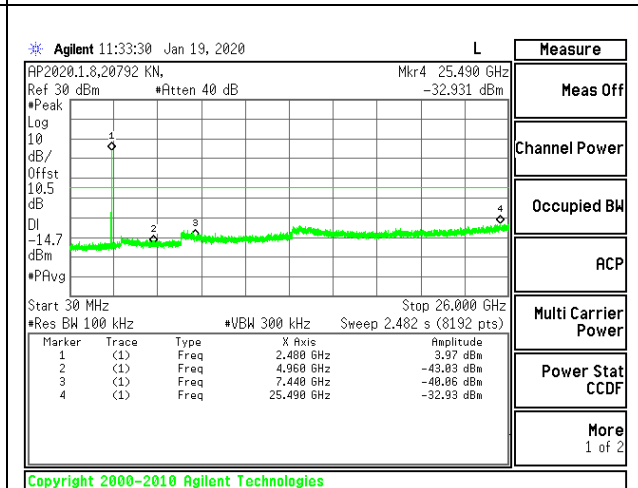
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

## 9. RADIATED TEST RESULTS

### 9.1. LIMITS AND PROCEDURE

#### 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 as applicable 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.

**KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification**

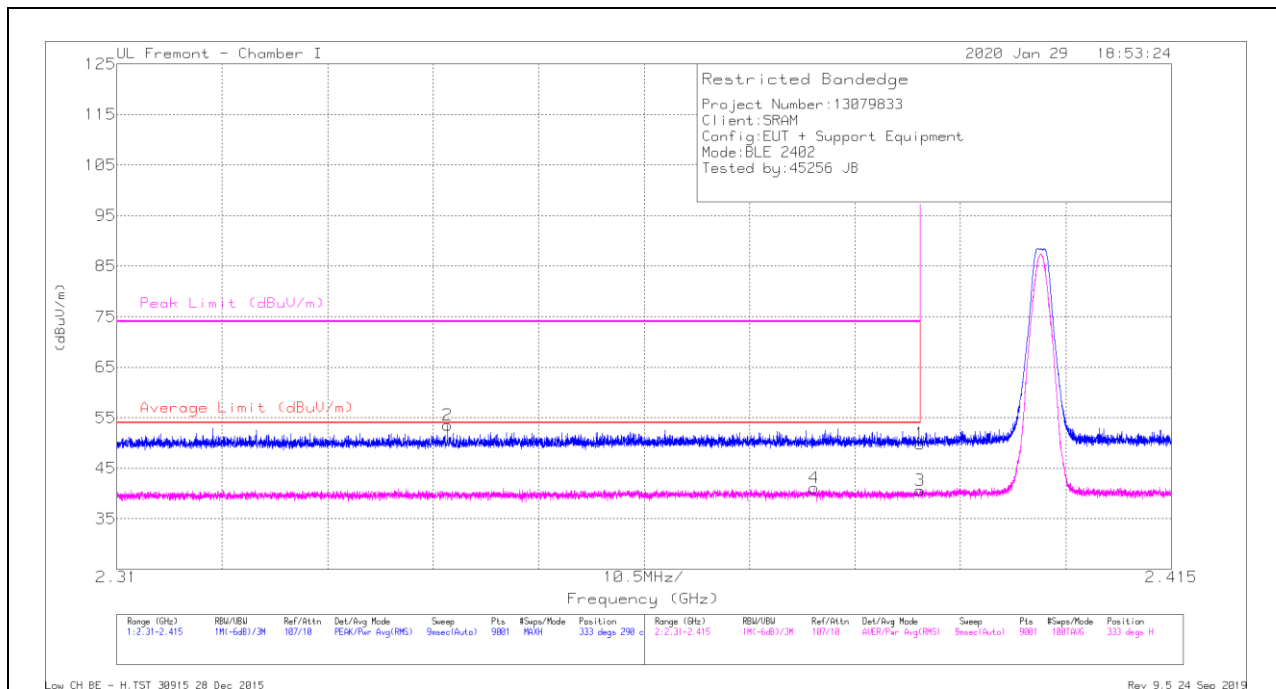
Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

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

## 9.2. TRANSMITTER ABOVE 1 GHz

### BANDEDGE (LOW CHANNEL)

#### HORIZONTAL RESULT



#### Trace Markers

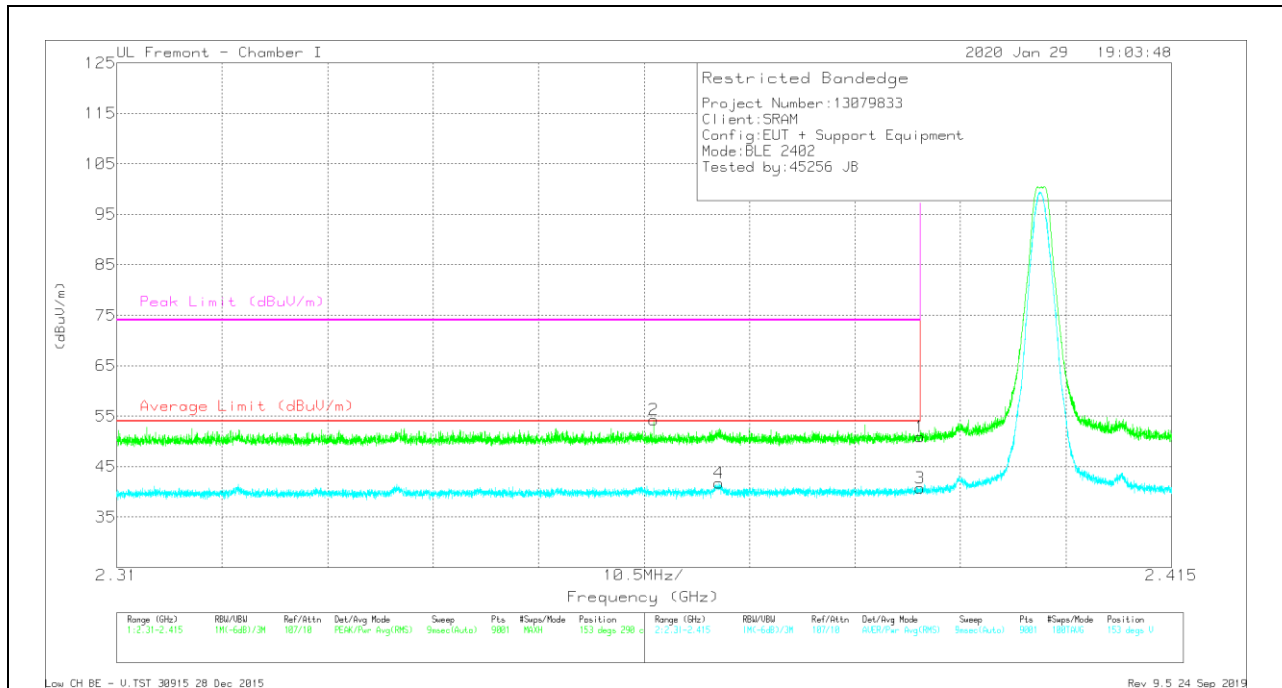
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	37.66	Pk	31.9	-19.7	0	49.86	-	-	74	-24.14	333	290	H
2	* 2.34292	41.27	Pk	31.6	-19.4	0	53.47	-	-	74	-20.53	333	290	H
3	* 2.38999	28.38	RMS	31.9	-19.7	0	40.58	54	-13.42	-	-	333	290	H
4	* 2.37942	28.75	RMS	31.9	-19.6	0	41.05	54	-12.95	-	-	333	290	H

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

Pk - Peak detector

RMS - RMS detection

### VERTICAL RESULT



### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.38999	38.68	Pk	31.9	-19.7	0	50.88	-	-	74	-23.12	153	290	V
2	* 2.36345	42.03	Pk	31.8	-19.6	0	54.23	-	-	74	-19.77	153	290	V
3	* 2.38999	28.5	RMS	31.9	-19.7	0	40.7	54	-13.3	-	-	153	290	V
4	* 2.36998	29.27	RMS	31.9	-19.5	0	41.67	54	-12.33	-	-	153	290	V

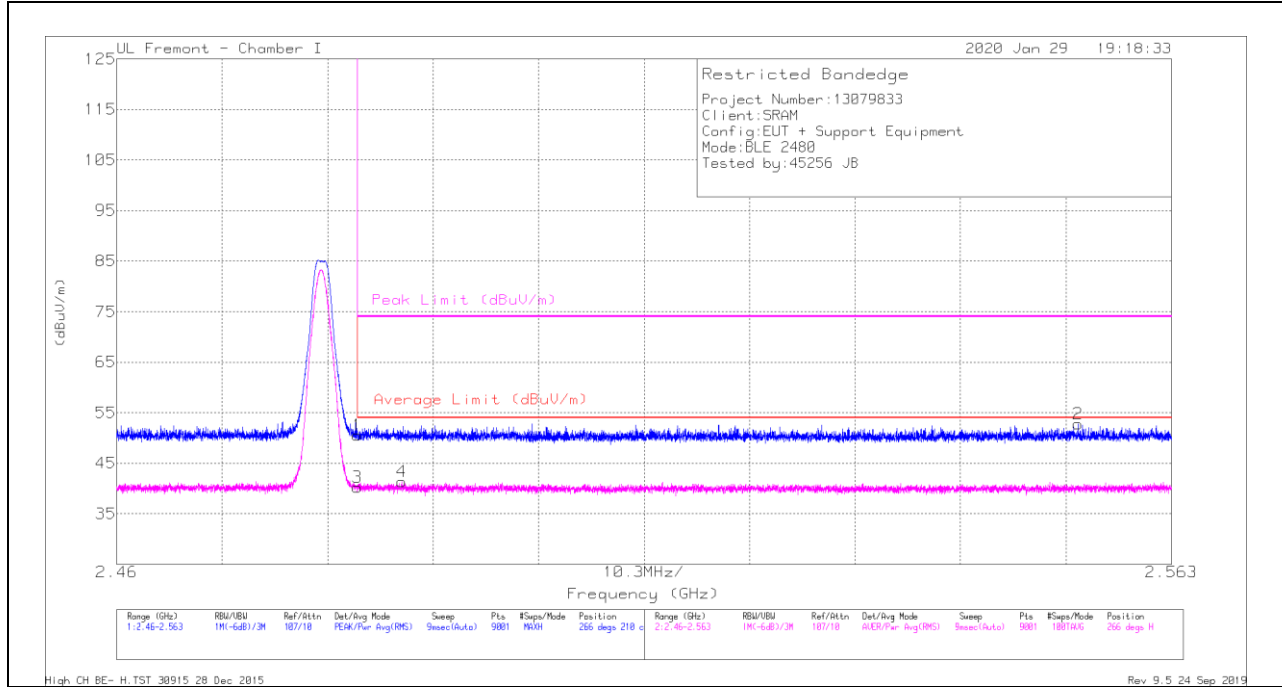
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

**BANDEDGE (HIGH CHANNEL)**

**HORIZONTAL RESULT**



**Trace Markers**

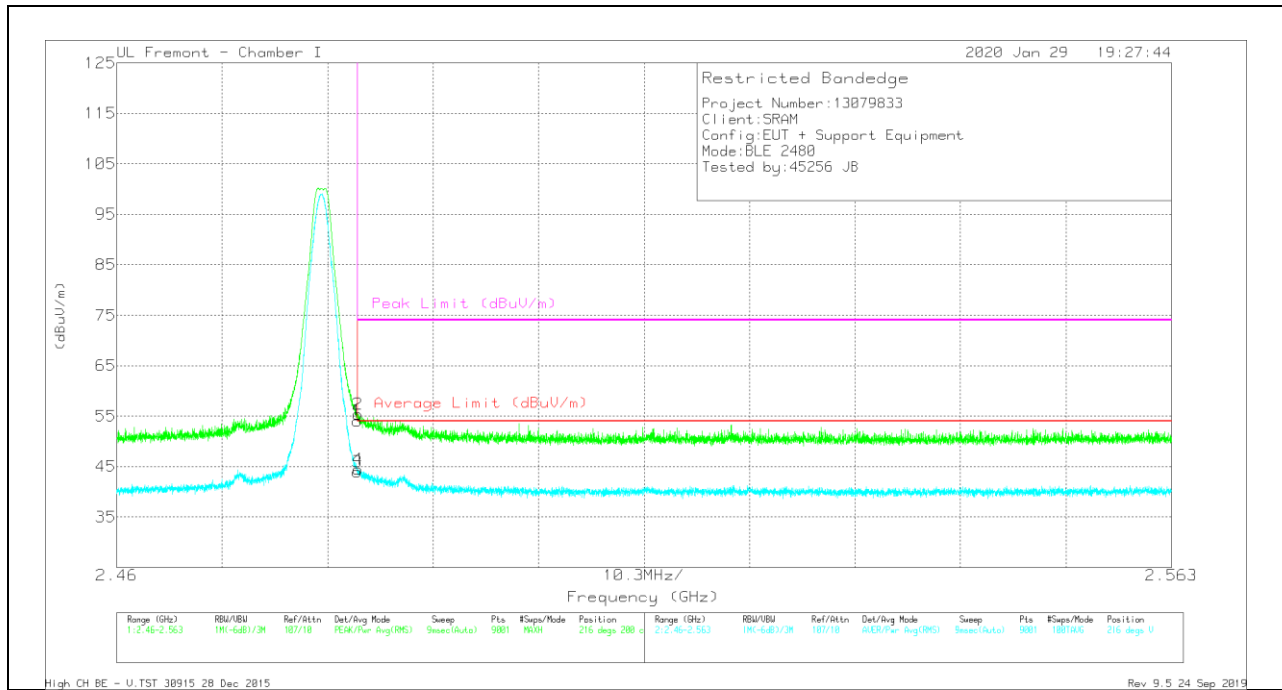
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	38.12	Pk	32.4	-20	0	50.52	-	-	74	-23.48	266	210	H
2	2.55388	40.53	Pk	32.3	-20	0	52.83	-	-	74	-21.17	266	210	H
3	* 2.48351	27.87	RMS	32.4	-20	0	40.27	54	-13.73	-	-	266	210	H
4	* 2.48787	29.02	RMS	32.3	-20	0	41.32	54	-12.68	-	-	266	210	H

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

Pk - Peak detector

RMS - RMS detection

### VERTICAL RESULT



### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	41.6	Pk	32.4	-20	0	54	-	-	74	-20	216	200	V
2	* 2.48355	43.01	Pk	32.4	-20	0	55.41	-	-	74	-18.59	216	200	V
3	* 2.48351	31.51	RMS	32.4	-20	0	43.91	54	-10.09	-	-	216	200	V
4	* 2.48353	32.09	RMS	32.4	-20	0	44.49	54	-9.51	-	-	216	200	V

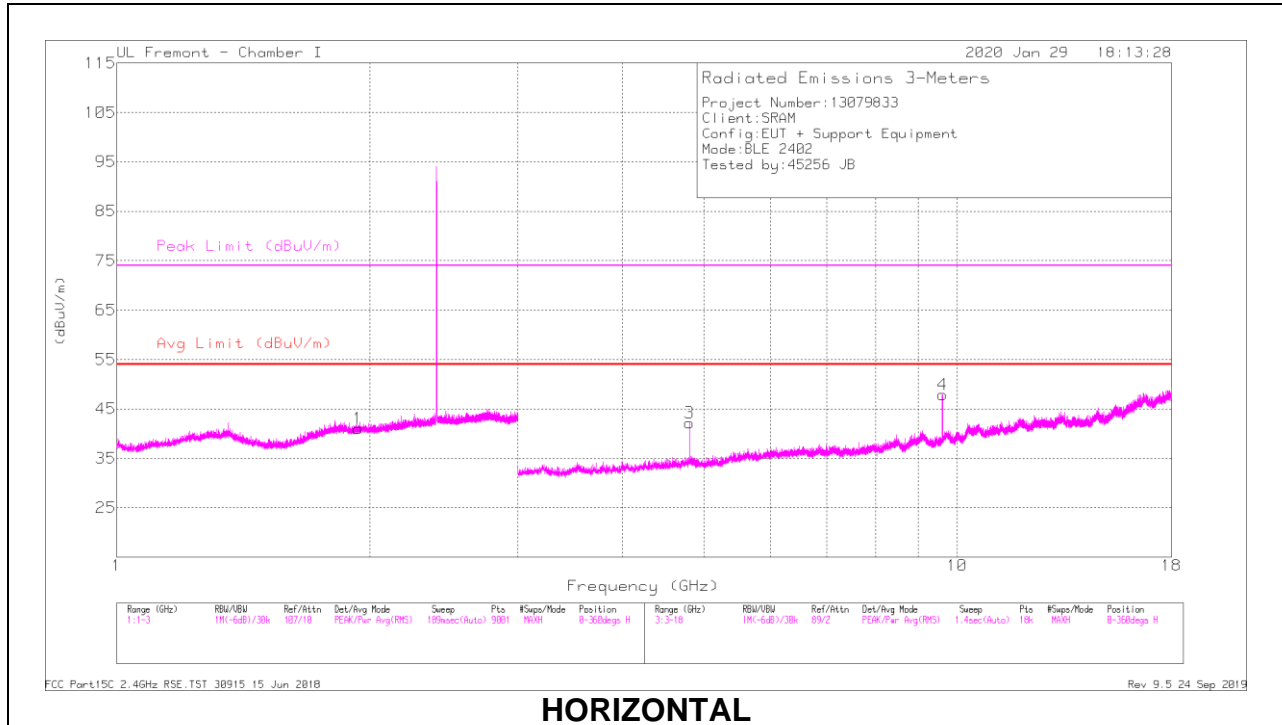
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

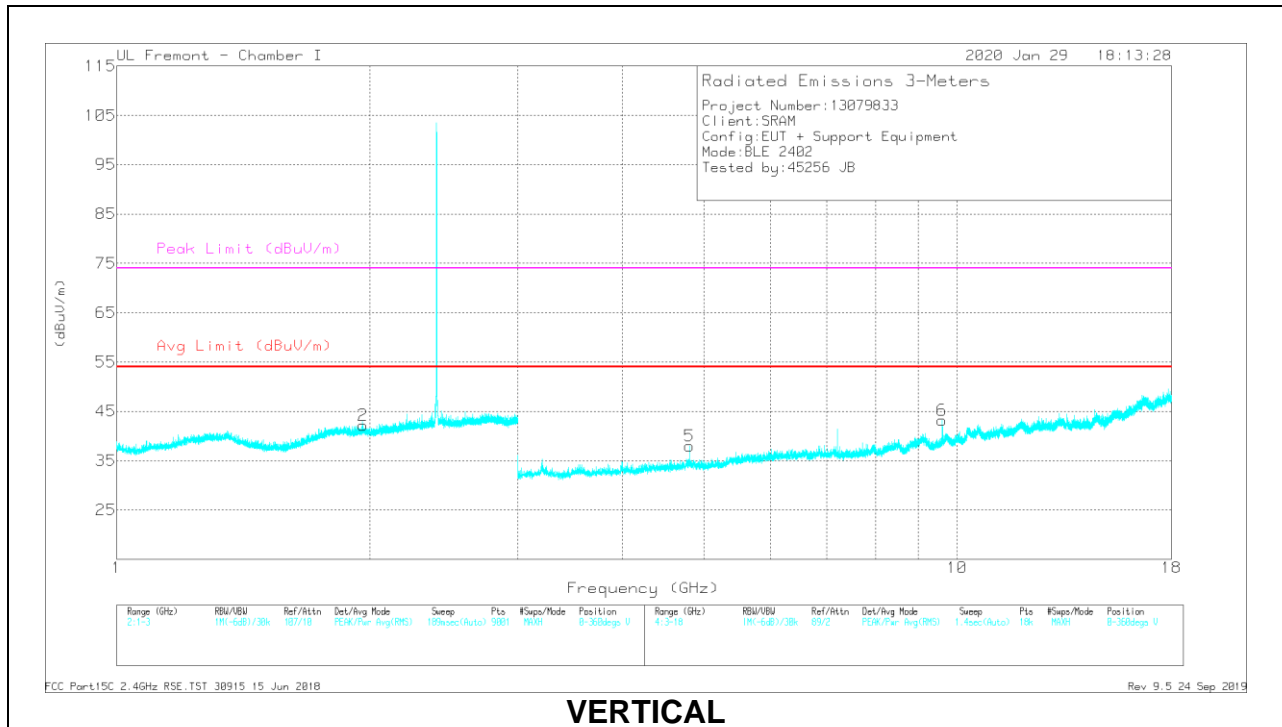
RMS - RMS detection

# HARMONICS AND SPURIOUS EMISSIONS

## LOW CHANNEL RESULTS



**HORIZONTAL**



**VERTICAL**

### RADIATED EMISSIONS

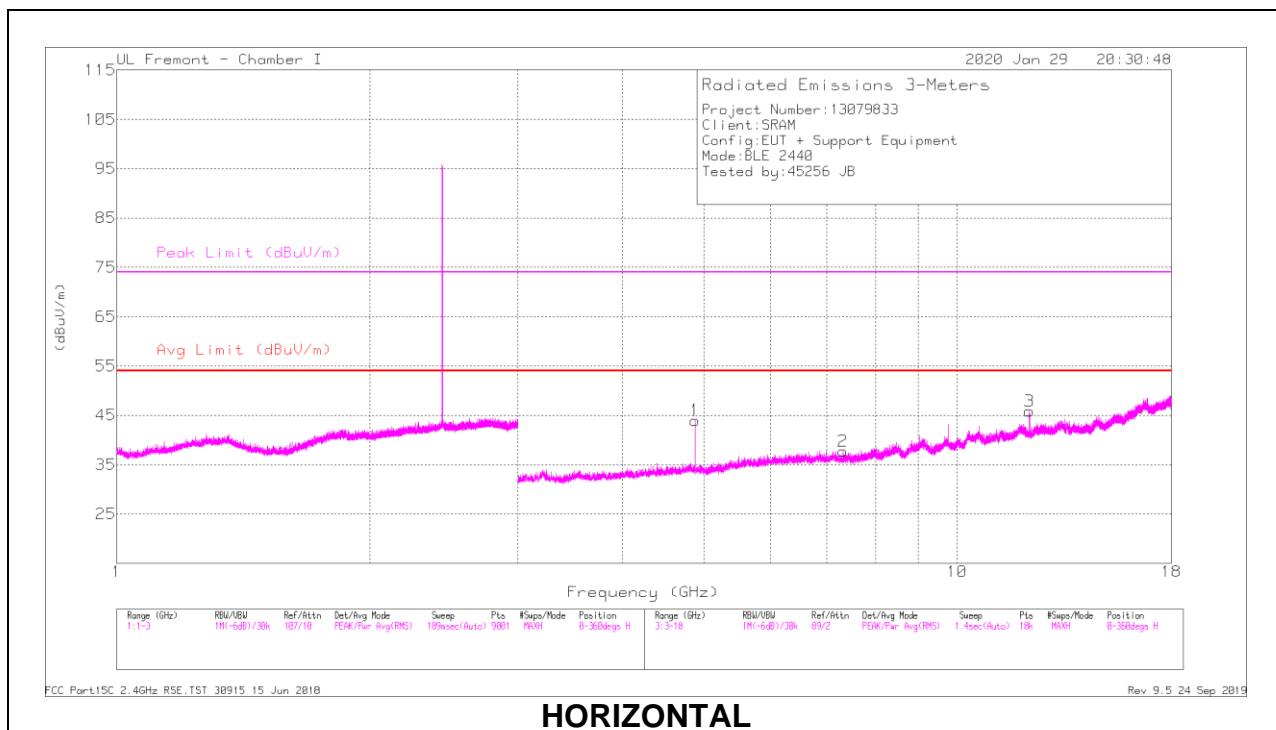
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.93622	30.97	Pk	30.7	-20.6	0	41.07	-	-	-	-	0-360	102	H
2	1.96311	31.91	Pk	31.1	-20.8	0	42.21	-	-	-	-	0-360	102	V
3	* 4.80334	40.2	PK2	34.2	-25.8	0	48.6	-	-	74	-25.4	257	140	H
	* 4.80373	32.81	MAv1	34.2	-25.8	0	41.21	54	-12.79	-	-	257	140	H
4	9.60954	31.65	Pk	36.7	-20.5	0	47.85	-	-	-	-	0-360	199	H
5	* 4.80367	37.79	PK2	34.2	-25.8	0	46.19	-	-	74	-27.81	218	171	V
	* 4.80385	29.32	MAv1	34.2	-25.8	0	37.72	54	-16.28	-	-	218	171	V
6	9.60704	27.09	Pk	36.7	-20.6	0	43.19	-	-	-	-	0-360	199	V

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

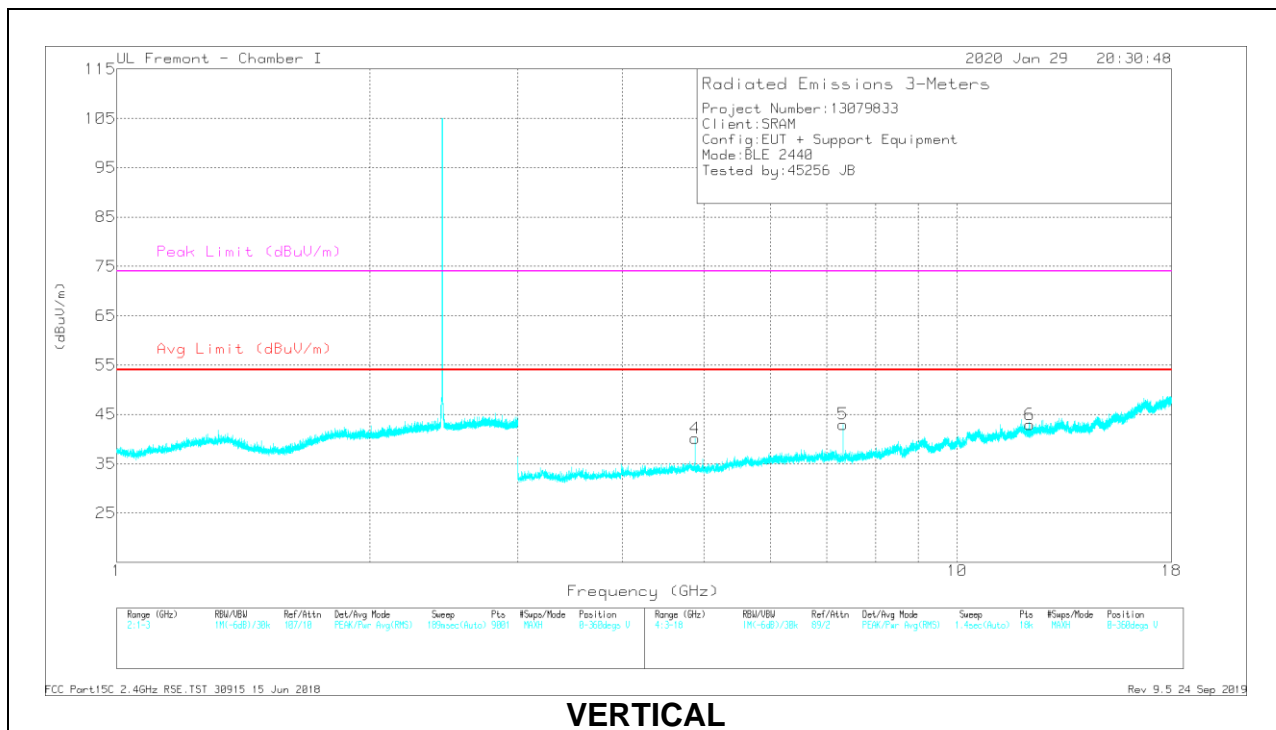
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

### MID CHANNEL RESULTS



**HORIZONTAL**



**VERTICAL**



**RADIATED EMISSIONS**

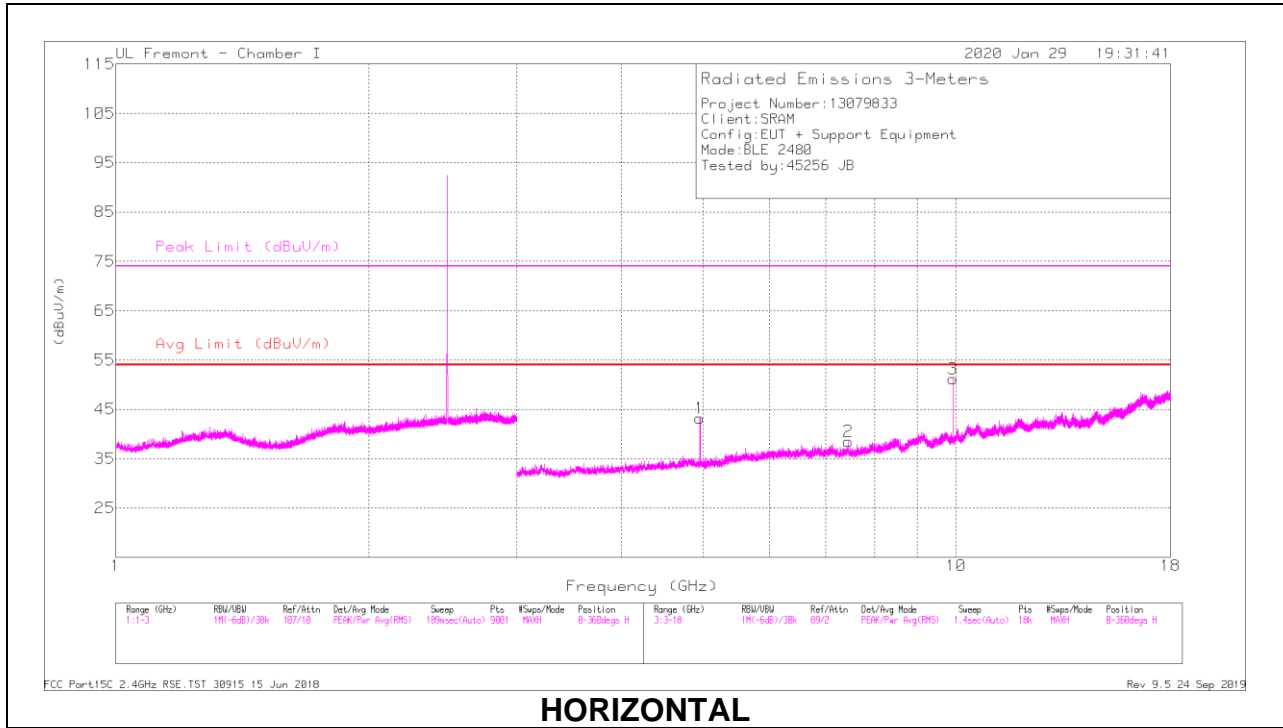
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.8798	40.45	PK2	34.1	-26.4	0	48.15	-	-	74	-25.85	260	123	H
	* 4.87966	32.88	MAv1	34.1	-26.4	0	40.58	54	-13.42	-	-	260	123	H
2	* 7.31913	34.54	PK2	35.5	-24.1	0	45.94	-	-	74	-28.06	220	104	H
	* 7.31913	26.2	MAv1	35.5	-24.1	0	37.6	54	-16.4	-	-	220	104	H
3	* 12.19886	33.17	PK2	39	-19.3	0	52.87	-	-	74	-21.13	98	144	H
	* 12.19852	24.37	MAv1	39	-19.3	0	44.07	54	-9.93	-	-	98	144	H
4	* 4.87936	38.61	PK2	34.1	-26.3	0	46.41	-	-	74	-27.59	222	217	V
	* 4.87963	31.46	MAv1	34.1	-26.4	0	39.16	54	-14.84	-	-	222	217	V
5	* 7.31887	37.69	PK2	35.5	-24.1	0	49.09	-	-	74	-24.91	100	167	V
	* 7.31912	30.16	MAv1	35.5	-24.1	0	41.56	54	-12.44	-	-	100	167	V
6	* 12.20166	31.61	PK2	39	-19.3	0	51.31	-	-	74	-22.69	91	157	V
	* 12.2014	21.41	MAv1	39	-19.3	0	41.11	54	-12.89	-	-	91	157	V

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

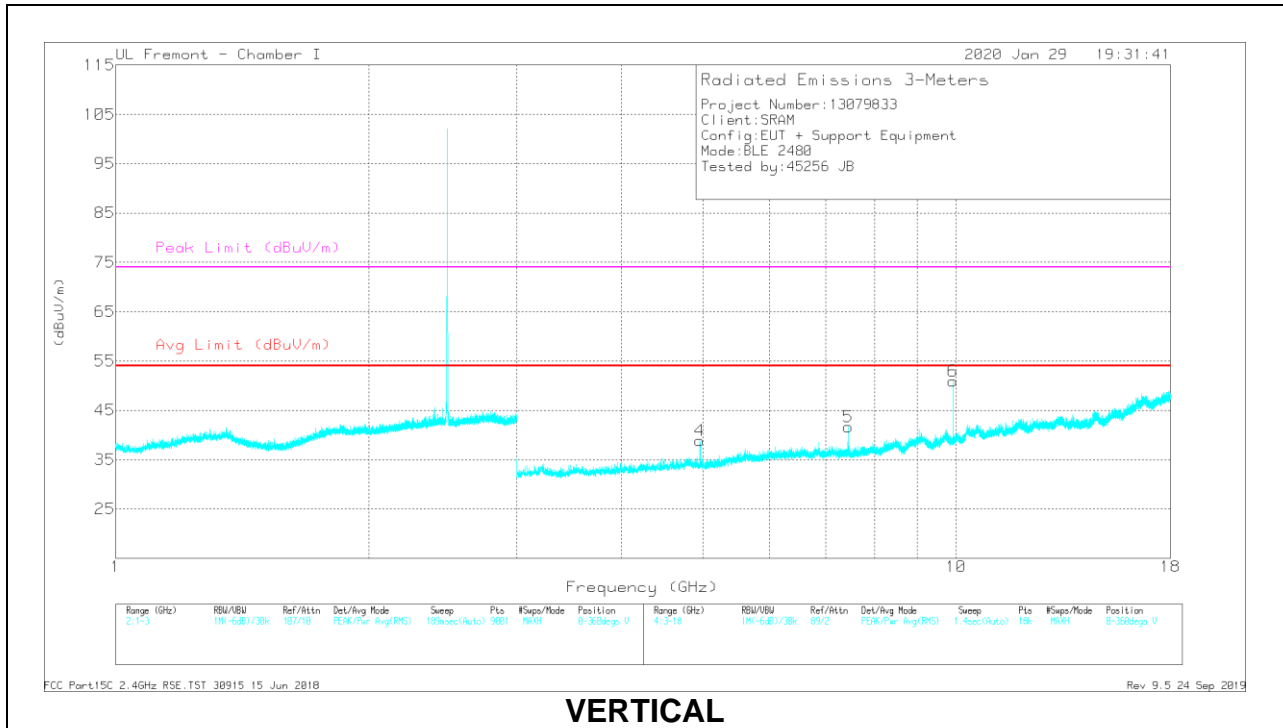
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

### HIGH CHANNEL RESULTS



**HORIZONTAL**



**VERTICAL**

**RADIATED EMISSIONS**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cb/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.96064	40.25	PK2	34.2	-26.8	0	47.65	-	-	74	-26.35	243	176	H
	* 4.95987	33.32	MAv1	34.2	-26.7	0	40.82	54	-13.18	-	-	243	176	H
2	* 7.43912	34.53	PK2	35.6	-22.9	0	47.23	-	-	74	-26.77	301	108	H
	* 7.44077	24.15	MAv1	35.6	-23	0	36.75	54	-17.25	-	-	301	108	H
3	9.91872	34.62	Pk	37	-20.4	0	51.22	-	-	-	-	0-360	102	H
4	* 4.95942	38.11	PK2	34.2	-26.8	0	45.51	-	-	74	-28.49	220	143	V
	* 4.95966	30.03	MAv1	34.2	-26.7	0	37.53	54	-16.47	-	-	220	143	V
5	* 7.44099	35.53	PK2	35.6	-23	0	48.13	-	-	74	-25.87	249	118	V
	* 7.43909	27.79	MAv1	35.6	-22.9	0	40.49	54	-13.51	-	-	249	118	V
6	9.91872	34.28	Pk	37	-20.4	0	50.88	-	-	-	-	0-360	199	V

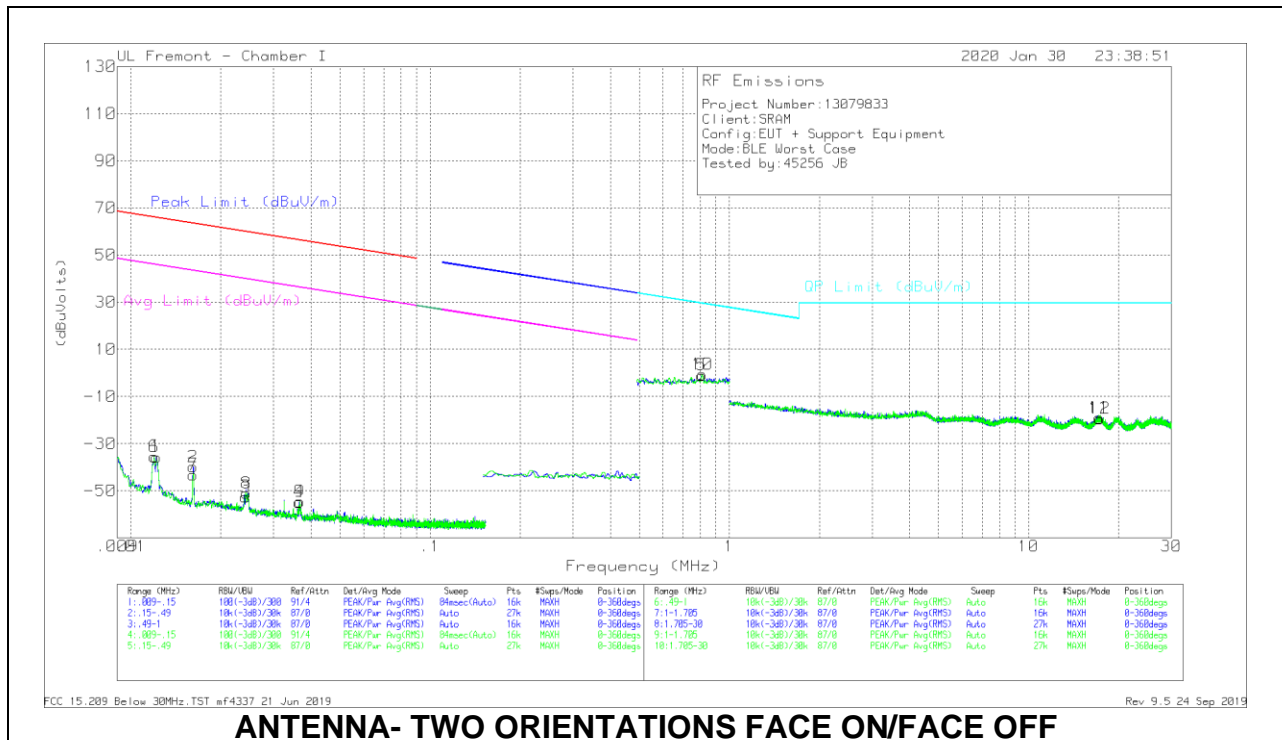
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

### 9.3. WORST CASE BELOW 30MHz

#### SPURIOUS EMISSIONS BELOW 30 MHz (WORST-CASE CONFIGURATION)



#### ANTENNA- TWO ORIENTATIONS FACE ON/FACE OFF

#### Below 30MHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Cables w/ PRE0180175 (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.01216	16.8	Pk	59.9	-32.4	-80	-35.7	65.89	-101.59	45.89	-81.59	0-360
2	.01616	13.25	Pk	59.3	-32.4	-80	-39.85	63.42	-103.27	43.42	-83.27	0-360
3	.02415	1.44	Pk	58.3	-32.3	-80	-52.56	59.93	-112.49	39.93	-92.49	0-360
4	.03647	.12	Pk	57.2	-32.2	-80	-54.88	56.35	-111.23	36.35	-91.23	0-360
6	.01196	16.99	Pk	59.9	-32.4	-80	-35.51	66.03	-101.54	46.03	-81.54	0-360
7	.01612	9.86	Pk	59.3	-32.4	-80	-43.24	63.44	-106.68	43.44	-86.68	0-360
8	.02435	2.97	Pk	58.3	-32.3	-80	-51.03	59.86	-110.89	39.86	-90.89	0-360
9	.03672	.39	Pk	57.2	-32.2	-80	-54.61	56.29	-110.9	36.29	-90.9	0-360

Pk - Peak detector

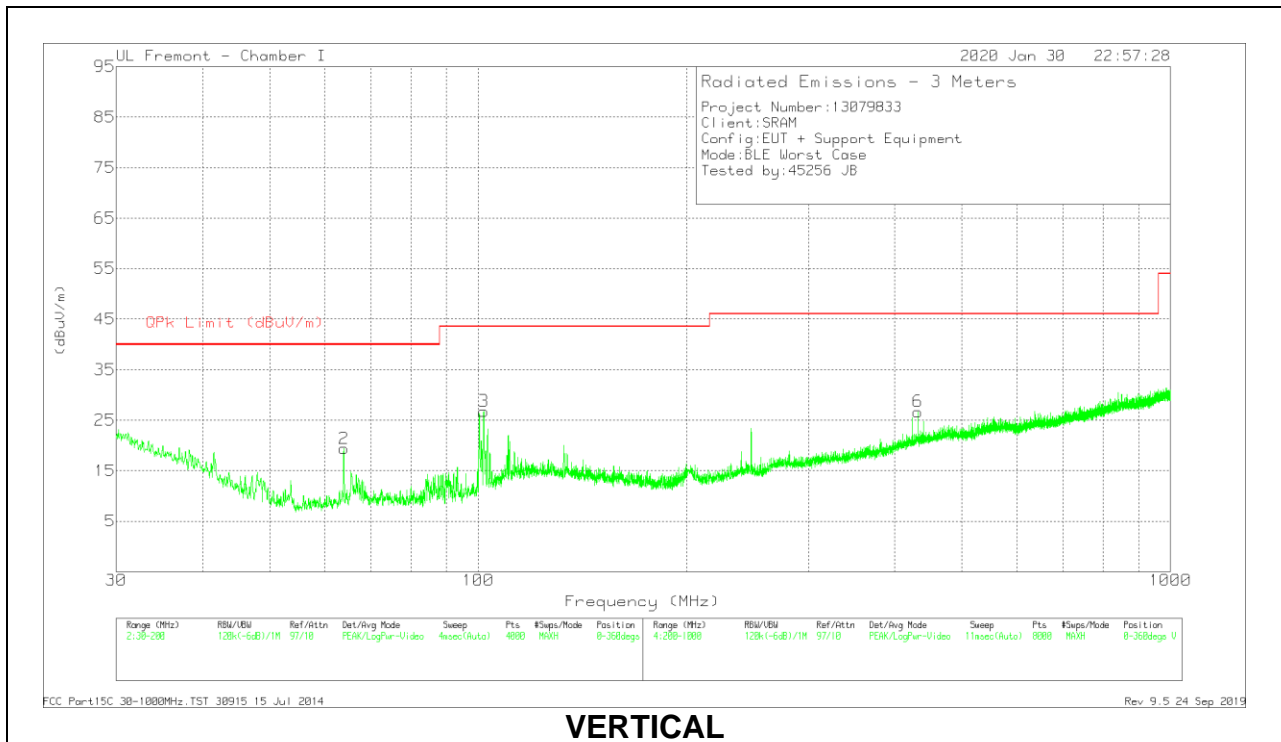
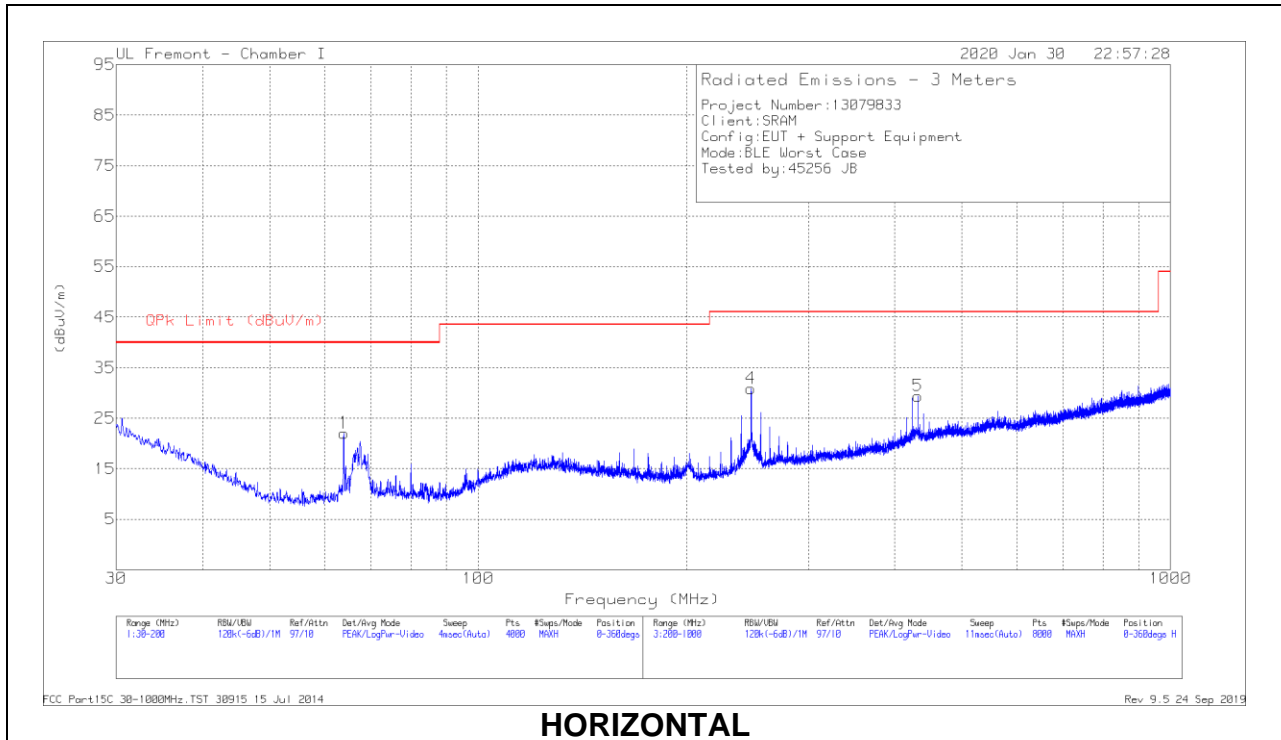
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (ACF)	Cables w/ PRE0180175 (dB)	Dist Corr 30m (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	.80835	14.71	Pk	56.1	-31.8	-40	-9.9	29.46	-30.45	0-360
10	.81133	15	Pk	56.1	-31.8	-40	-7	29.43	-30.13	0-360
11	17.21226	18.12	Pk	34.2	-31.4	-40	-19.08	29.5	-48.58	0-360
12	17.2657	17.79	Pk	34.2	-31.4	-40	-19.41	29.5	-48.91	0-360

Pk - Peak detector

**Note:** The Limits in CRF 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  $Y \cdot 51.5 = Z$  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.

### 9.4. WORST CASE BELOW 1 GHz

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



**Below 1GHz Data**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0184052 (dB/m)	Amp Cbl (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	63.9663	39.45	Pk	13.6	-31	0	22.05	40	-17.95	0-360	399	H
2	63.9663	36.78	Pk	13.6	-31	0	19.38	40	-20.62	0-360	100	V
3	101.8861	40.95	Pk	16.5	-30.7	0	26.75	43.52	-16.77	0-360	100	V
4	* 248.0194	45.28	Pk	17.4	-30.1	0	32.58	46.02	-13.44	78	131	H
	* 248.0194	43.16	Qp	17.4	-30.1	0	30.46	46.02	-15.56	78	131	H
5	431.9301	36.61	Pk	22.4	-29.6	0	29.41	46.02	-16.61	0-360	199	H
6	431.9301	33.87	Pk	22.4	-29.6	0	26.67	46.02	-19.35	0-360	98	V

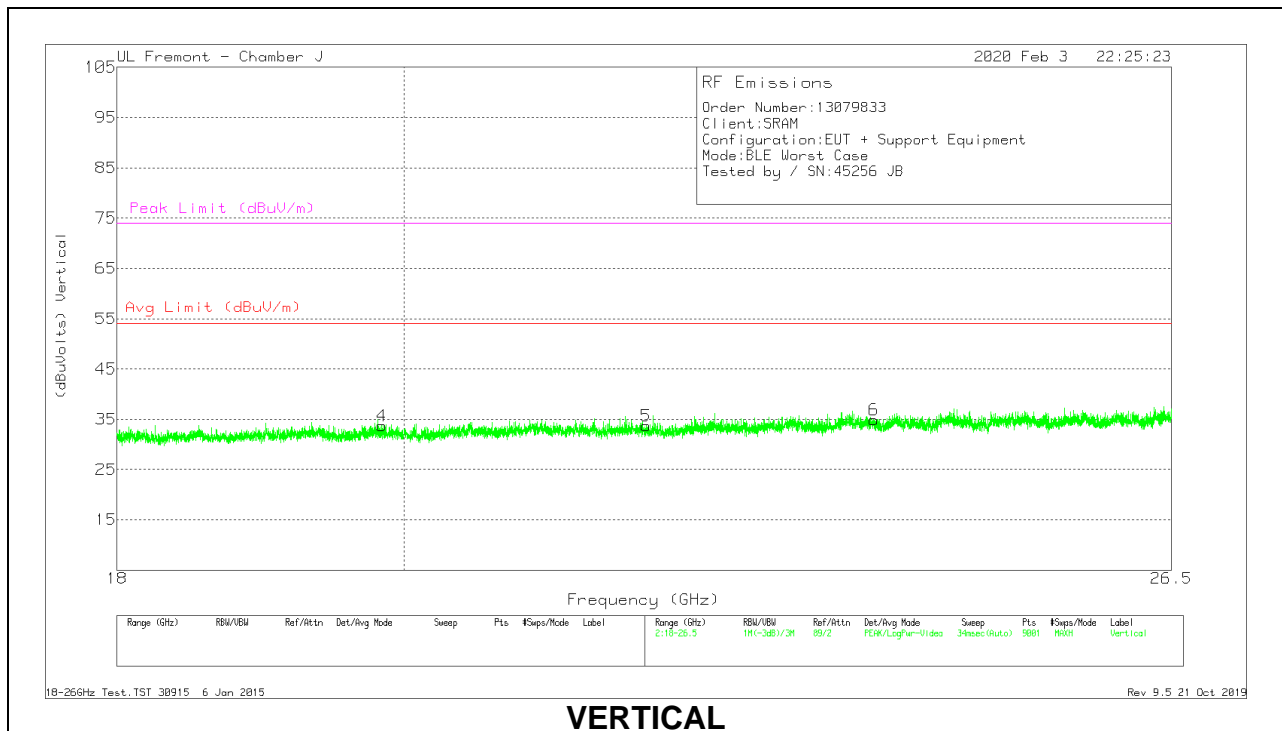
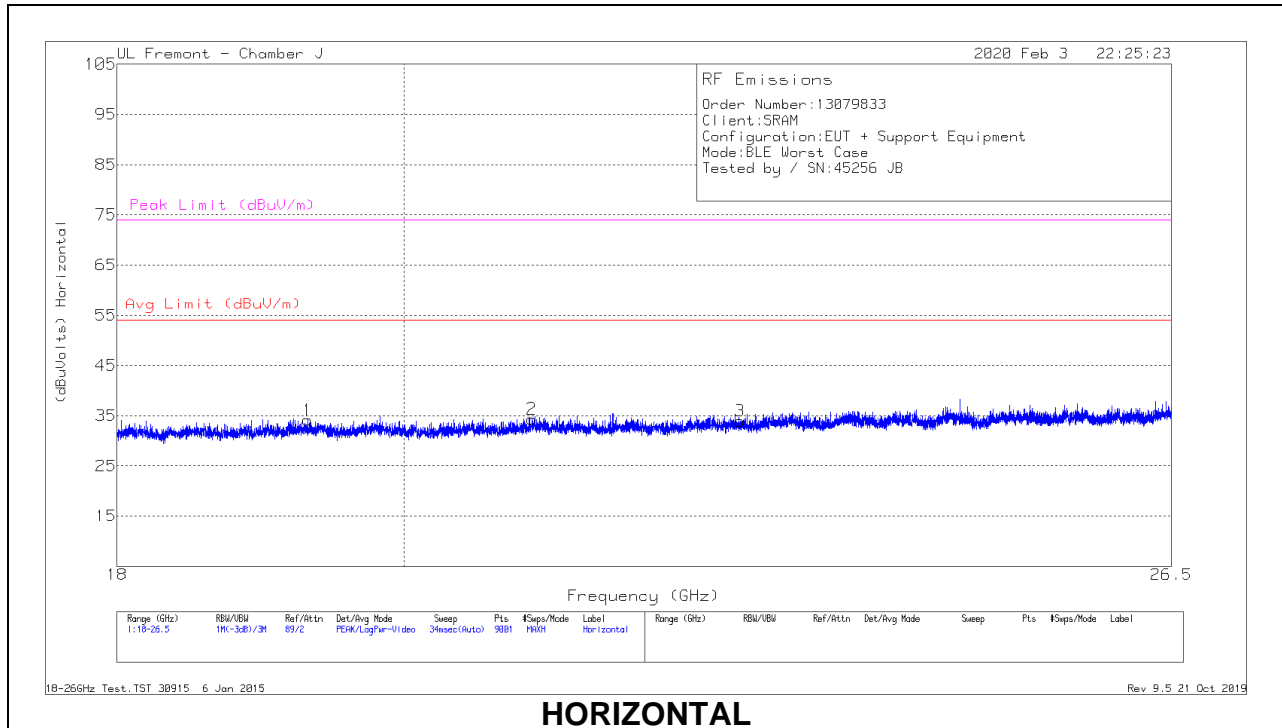
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Qp - Quasi-Peak detector

### 9.5. 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 (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.30428	68.06	Pk	32.7	-57.1	-9.5	34.16	54	-19.84	74	-39.84
2	20.95705	67.63	Pk	33.3	-57.1	-9.5	34.33	54	-19.67	74	-39.67
3	22.62116	67.55	Pk	33.6	-57.7	-9.5	33.95	54	-20.05	74	-40.05
4	19.836	67.51	Pk	32.8	-57.1	-9.5	33.71	54	-20.29	74	-40.29
5	21.85616	67.5	Pk	33.3	-57.6	-9.5	33.7	54	-20.3	74	-40.3
6	23.75733	67.06	Pk	34.2	-56.9	-9.5	34.86	54	-19.14	74	-39.14

Pk - Peak detector