



# **CERTIFICATION TEST REPORT**

**Report Number. :** 12122325-E2V3

**Applicant :** SRAM LLC  
1000 W Fulton Market 4<sup>th</sup> Floor  
Chicago, IL 60607 U.S.A

**Model :** 13200

**FCC ID :** C9O-SPMB1

**IC :** 10161A-SPMB1

**EUT Description :** Bicycle Seatpost with AIREA, BLE and ANT+ Radios

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

**Date Of Issue:**

November 05, 2018

**Prepared by:**

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NVLAP LAB CODE 200065-0

## REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	10/10/2018	Initial Issue	
V2	10/23/2018	Updated Section 1, 2, and 6	Steven Tran
V3	11/5/2018	Added Channel 25 data	Glenn Escano

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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, U.S.A

**EUT DESCRIPTION:** Bicycle Seatpost with AIREA, BLE and ANT+ Radios

**MODEL:** 13200

**SERIAL NUMBER:** 1514030014 (Conducted); 1514030015 (Radiated)

**DATE TESTED:** January 16<sup>th</sup> 2018– January 26<sup>th</sup>, 2018 and October 26<sup>th</sup> – 29<sup>th</sup>, 2018

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

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For  
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UL Verification Services Inc.

Reviewed By:



STEVEN TRAN  
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, KDB 558074 D01 v05, 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.
<input checked="" type="checkbox"/> Chamber A (IC:2324B-1)	<input checked="" type="checkbox"/> Chamber D (IC:22541-1)	<input checked="" type="checkbox"/> Chamber I (IC: 2324A-5)
<input checked="" type="checkbox"/> Chamber B (IC:2324B-2)	<input type="checkbox"/> Chamber E (IC:22541-2)	<input type="checkbox"/> Chamber J (IC: 2324A-6)
<input type="checkbox"/> Chamber C (IC:2324B-3)	<input checked="" type="checkbox"/> Chamber F (IC:22541-3)	<input type="checkbox"/> Chamber K (IC: 2324A-1)
	<input type="checkbox"/> Chamber G (IC:22541-4)	<input type="checkbox"/> Chamber L (IC: 2324A-3)
	<input type="checkbox"/> Chamber H (IC:22541-5)	

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

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

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} + \\ &\text{Cable Loss (dB)} - \text{Preamp Gain (dB)} \\ 36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} &= 28.9 \text{ dBuV/m} \end{aligned}$$

### 4.3. MEASUREMENT UNCERTAINTY

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

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

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

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a Bicycle Seatpost with AIREA, BLE and ANT+ Radios.

### 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)
2405-2480	802.15.4 AIREA	3.87	2.44	3.6	2.29

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a chip antenna, with a maximum gain of -2 dBi.

### 5.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was A-1.0.

The test utility software used during testing was Lightblue v2.6.4

### 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.



## 5.6. DESCRIPTION OF TEST SETUP

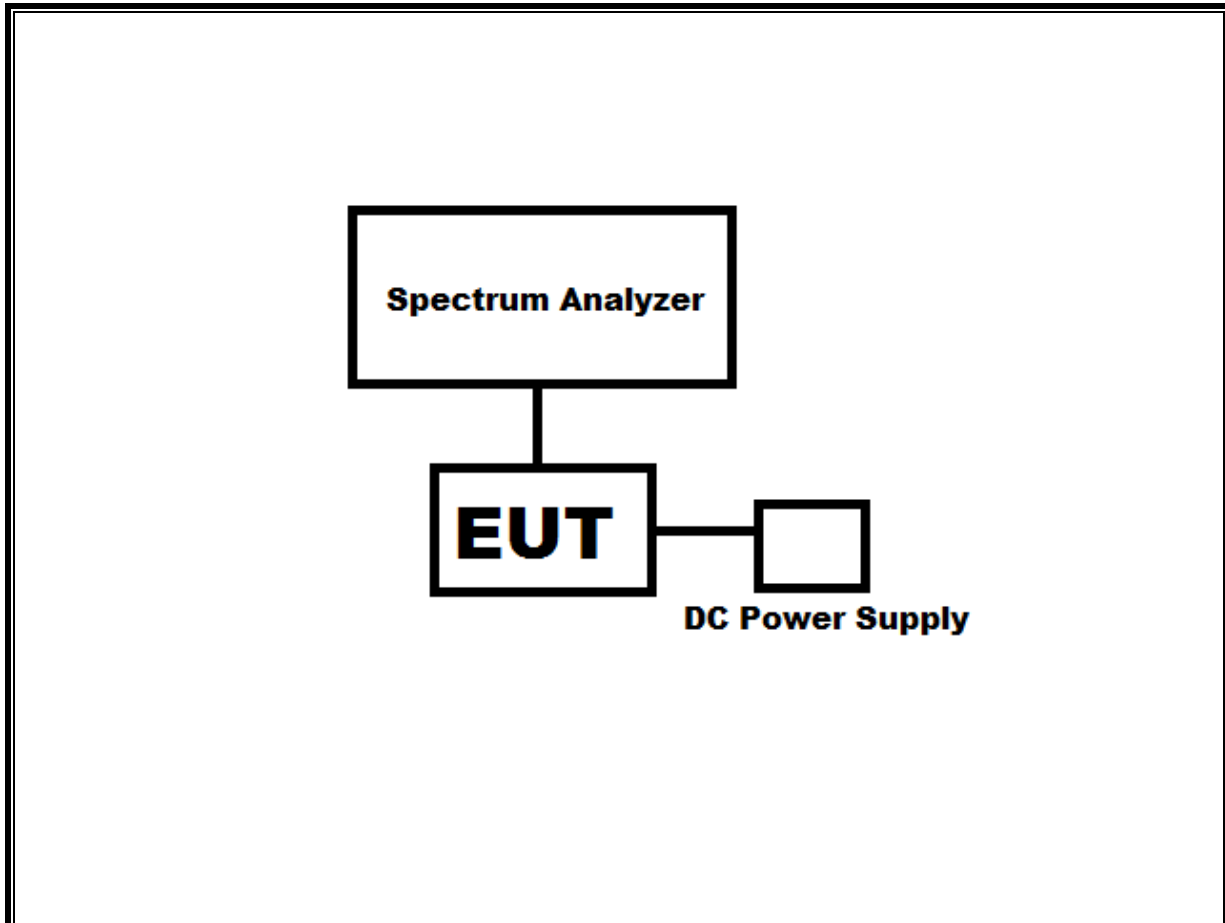
### SUPPORT EQUIPMENT

Support Equipment List			
Description	Manufacturer	Model	Serial Number
Ipod Touch	Apple	MKJ02LL/A	CCQVRHY2GGNL

### TEST SETUP

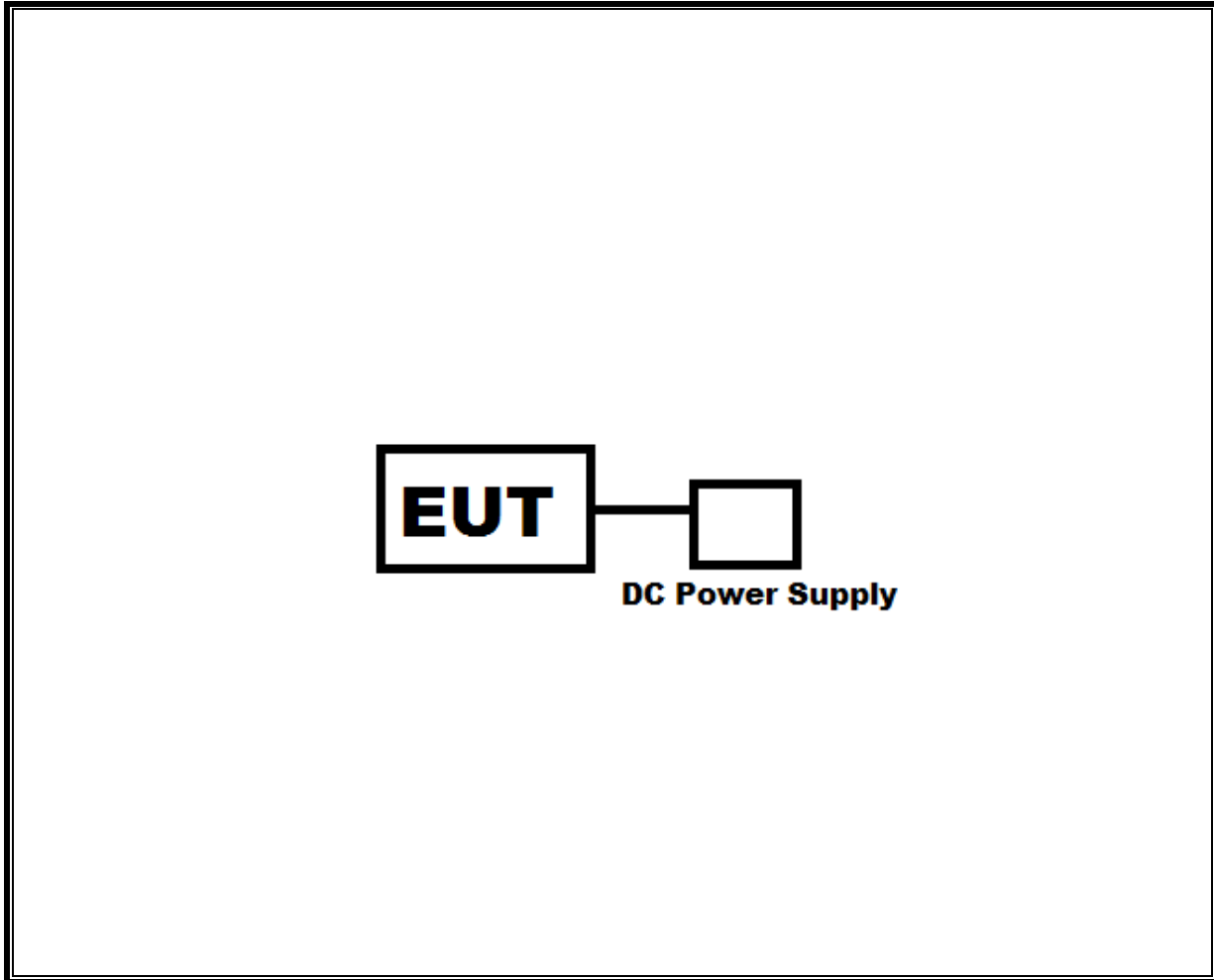
The EUT is powered by a dummy battery with a DC power supply. The iPod Touch wirelessly sends commands to the EUT.

### SETUP DIAGRAM FOR CONDUCTED TESTS



\*Note – The DC power supply is used only during testing. During normal operation the EUT is powered by a supplied battery pack

**SETUP DIAGRAM FOR RADIATED TESTS**



\*Note – The DC power supply is used only during testing. During normal operation the EUT is powered by a supplied battery pack

## 6. MEASUREMENT METHOD

6 dB BW: ANSI C63.10 Subclause -11.8.1 RBW  $\geq$  DTS BW

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

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

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

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

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

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

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

Band-edge: ANSI C63.10 Subclause -11.13.3.4 Integration method -Trace averaging across ON and OFF times DC correction

## 7. TEST AND MEASUREMENT EQUIPMENT

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

Test Equipment List					
Description	Manufacturer	Model	ID No.	Cal Date	Cal Due
Spectrum Analyzer	Agilent	N9030A	T1210	07/17/17	07/17/18
Spectrum Analyzer	Agilent	N9030A	T907	01/31/17	01/31/18
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB3	T899	06/15/17	06/15/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T863	06/09/17	06/09/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T862	05/24/18	05/24/19
RF Preamplifier, 10kHz - 1GHz	HP	8447D	T10	02/15/17	02/15/18
RF Preamplifier, 1 - 8GHz	Miteq	AMF-4D-01000800-30-29P	T1156	12/16/17	12/16/18
Spectrum Analyzer	Agilent	N9030A	T341	11/12/17	11/12/18
Antenna, Horn, 1-18GHz	ETS-Lindgren	3117	T711	01/30/17	01/30/18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	T428	12/30/17	12/30/18
RF Preamplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T740	12/30/17	12/30/18
RF Preamplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	171460	08/01/18	08/01/19
Antenna, Active Loop 9kHz – 30MHz	Com-Power	AL-130R	T1866	10/10/17	10/10/18
Antenna, Horn, 18-26GHz	ARA	MWH-1826G	T89	01/18/18	01/18/19
Spectrum Analyzer	Keysight	N9030A	T1113	12/21/17	12/21/18
RF Preamplifier, 1-26GHz	Agilent	8449B	T404	07/23/17	07/23/18
RF Power Meter	Agilent	N1911A	T229	08/14/17	08/14/18
RF Power Sensor	Agilent	N1921A	T1225	03/29/17	03/29/18

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, Dec 01, 2016
Antenna Port Software	UL	UL RF	Ver 7.8, Jan 10, 2018

## 8. ANTENNA PORT TEST RESULTS

### 8.1. ON TIME AND DUTY CYCLE

#### LIMITS

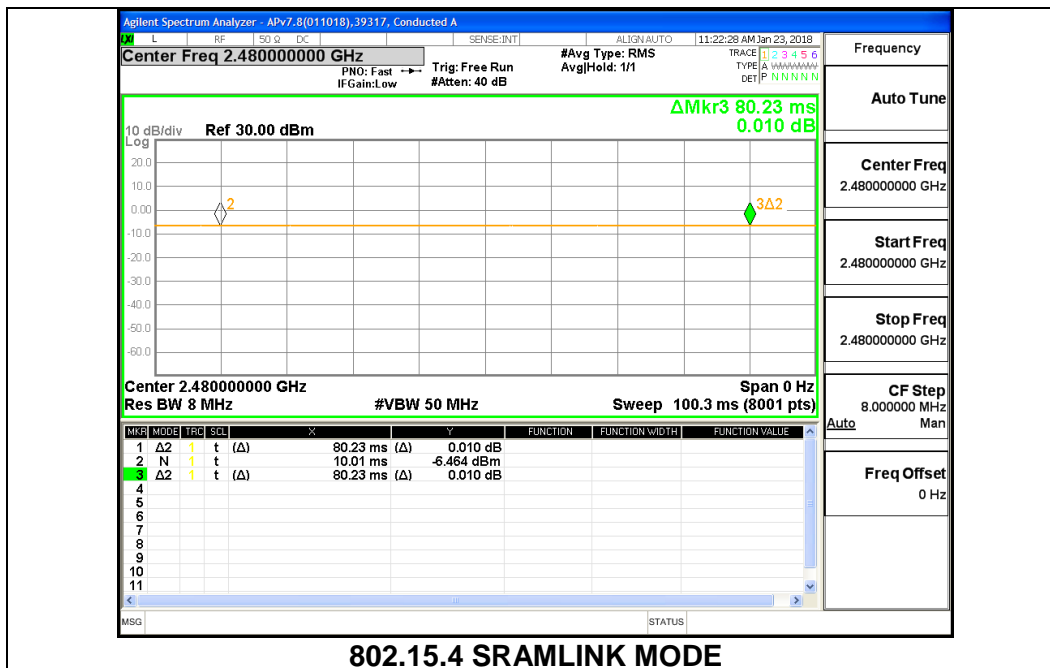
None; for reporting purposes only.

#### 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/B Minimum VBW (kHz)
802.15.4 SRAMLINK	80.2	80.2	1.000	100.00%	0.00	0.010



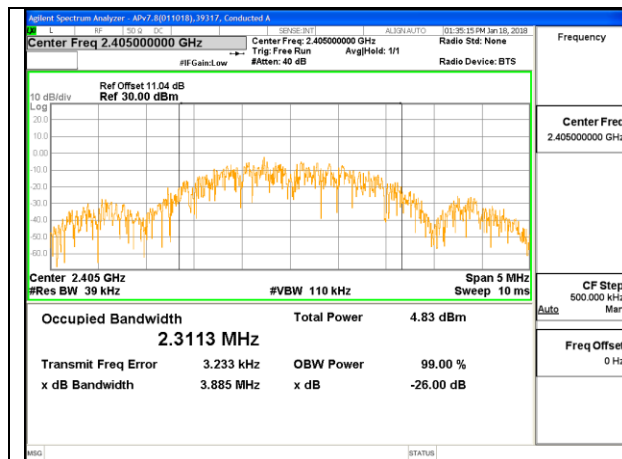
## 8.2. 99% BANDWIDTH

### LIMITS

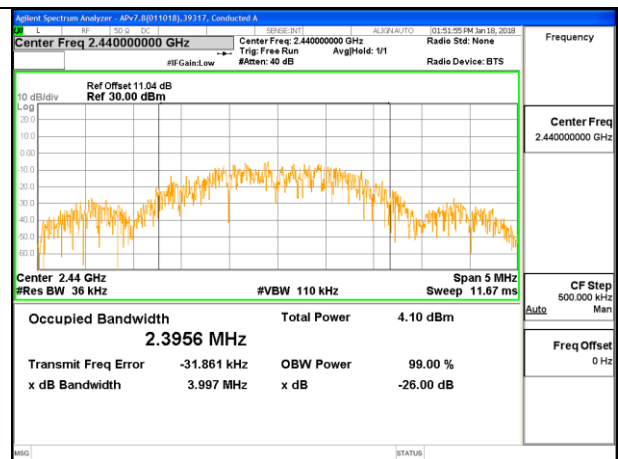
None; for reporting purposes only.

### RESULTS

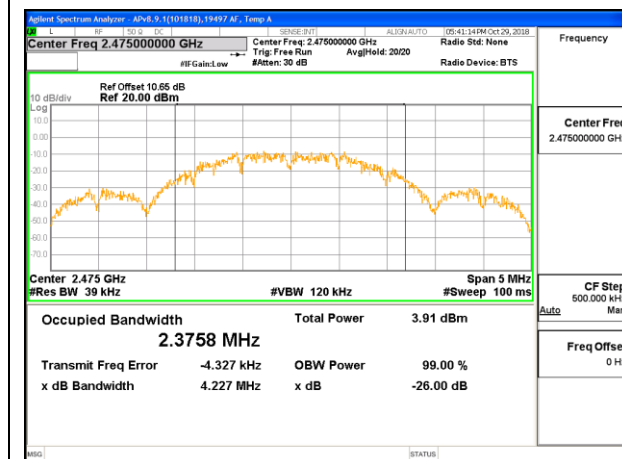
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low 11	2405	2.3113
Mid 18	2440	2.3956
High 25	2475	2.3758
High 26	2480	2.3924



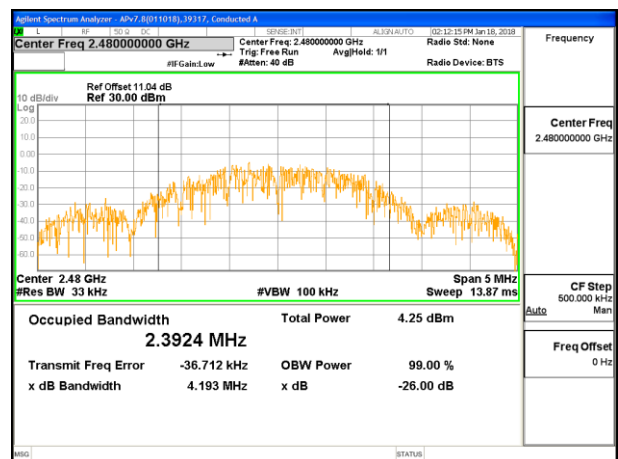
**LOW CHANNEL 11**



**MID CHANNEL 18**



**HIGH CHANNEL 25**



**HIGH CHANNEL 26**

### 8.3. 6 dB BANDWIDTH

#### LIMITS

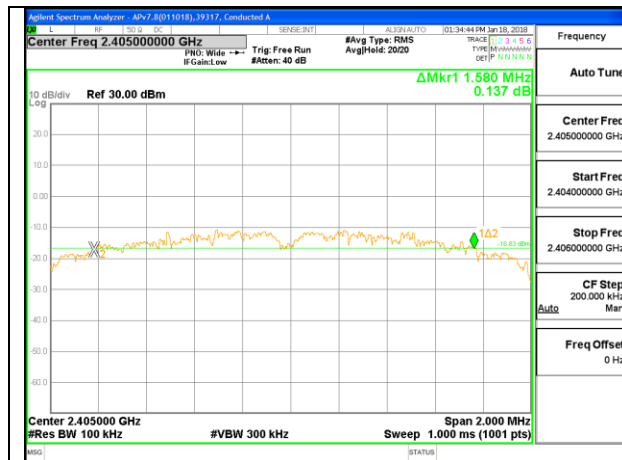
FCC §15.407 (e)

RSS-247 5.2 (a)

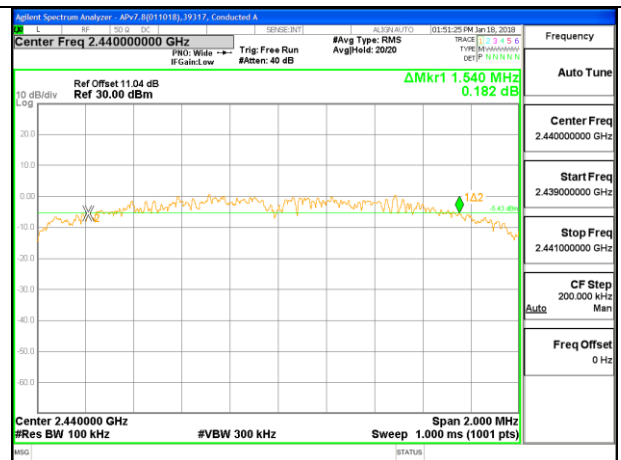
The minimum 6 dB bandwidth shall be at least 500 kHz.

#### RESULTS

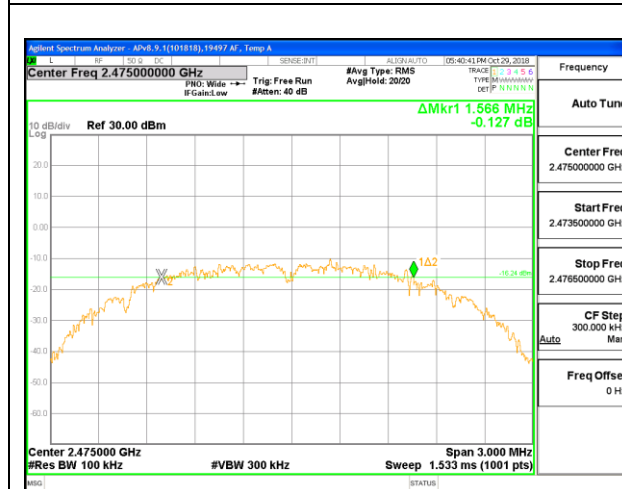
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low 11	2405	1.580	0.5
Mid 18	2440	1.540	0.5
High 25	2475	1.566	0.5
High 26	2480	1.550	0.5



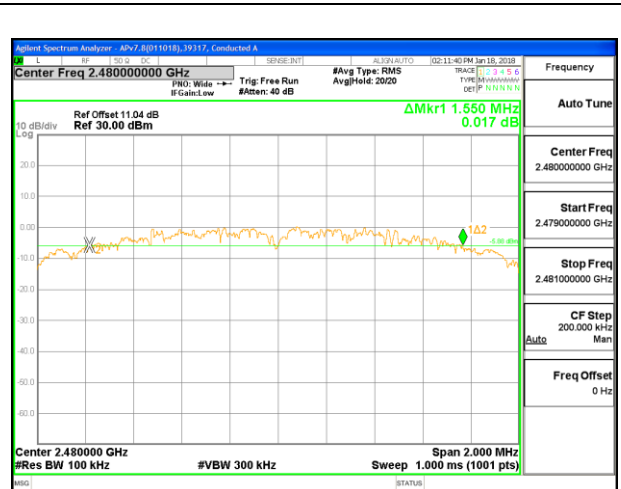
LOW CHANNEL 11



MID CHANNEL 18



HIGH CHANNEL 25



HIGH CHANNEL 26

## **8.4. OUTPUT POWER**

### **LIMITS**

#### **FCC §15.247 (b) (3)**

#### **RSS-247 5.4 (d)**

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt, based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **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.

### **DIRECTIONAL ANTENNA GAIN**

There is only one transmitter output therefore the directional gain is equal to the antenna gain.



**RESULTS**

<b>Tested By:</b>	39317
<b>Date:</b>	01/31/18

**Limits**

Channel	Frequency (MHz)	Directional Gain (dBi)	FCC Power Limit (dBm)	ISED Power Limit (dBm)	ISED EIRP Limit (dBm)	Max Power (dBm)
Low 11	2405	-2.00	30.00	30	36	30.00
Mid 18	2440	-2.00	30.00	30	36	30.00
High 25	2475	-2.00	30.00	30	36	30.00
High 26	2480	-2.00	30.00	30	36	30.00

**Results**

Channel	Frequency (MHz)	Meas Power (dBm)	Total Corr'd Power (dBm)	Power Limit (dBm)	Margin (dB)
Low 11	2405	3.78	3.78	30.00	-26.22
Mid 18	2440	3.87	3.87	30.00	-26.13
High 25	2475	3.81	3.81	30.00	-26.19
High 26	2480	-2.76	-2.76	30.00	-32.76

## 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 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

<b>Tested By:</b>	39317
<b>Date:</b>	01/26/18

Channel	Frequency (MHz)	Meas Power (dBm)
Low 11	2405	3.51
Mid 18	2440	3.60
High 25	2475	3.87
High 26	2480	-3.61

## 8.6. POWER SPECTRAL DENSITY

### LIMITS

FCC §15.247 (e)

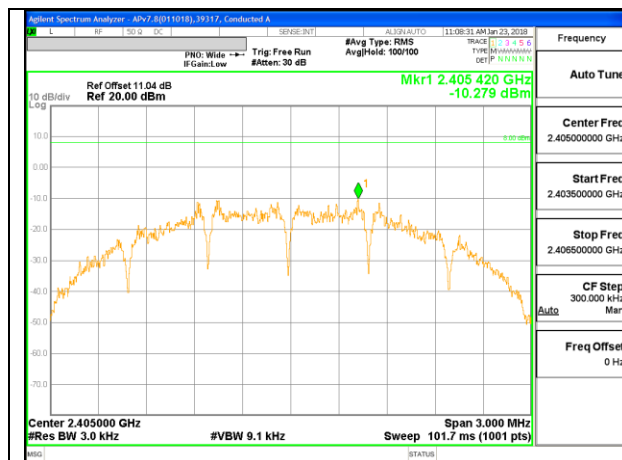
RSS-247 (5.2) (b)

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.

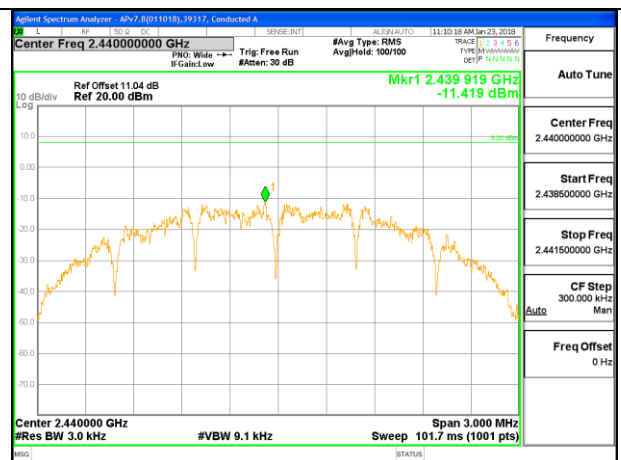
### RESULTS

#### PSD Results

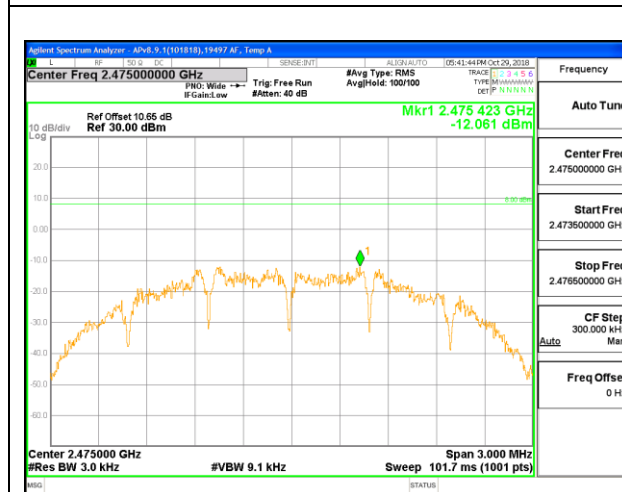
Channel	Frequency (MHz)	Chain 0 Meas (dBm/3kHz)	Total Corr'd PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low 11	2405	-10.28	-10.28	8.0	-18.3
Mid 18	2440	-11.42	-11.42	8.0	-19.4
High 25	2475	-12.06	-12.06	8.0	-20.1
High 26	2480	-11.36	-11.36	9.0	-20.4



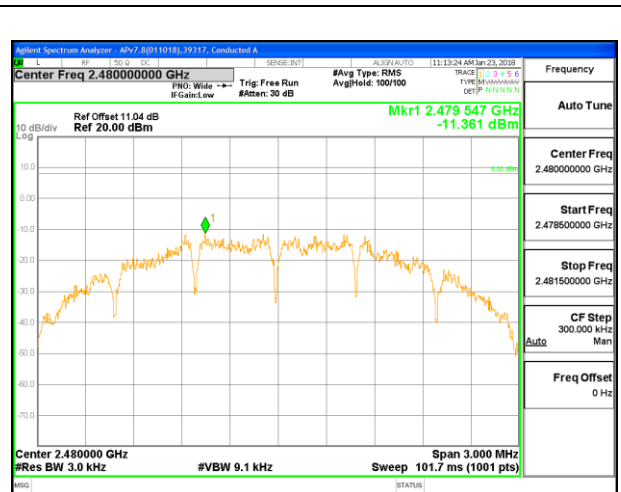
LOW CHANNEL 11



MID CHANNEL 18



HIGH CHANNEL 25



HIGH CHANNEL 26

## 8.7. CONDUCTED SPURIOUS EMISSIONS

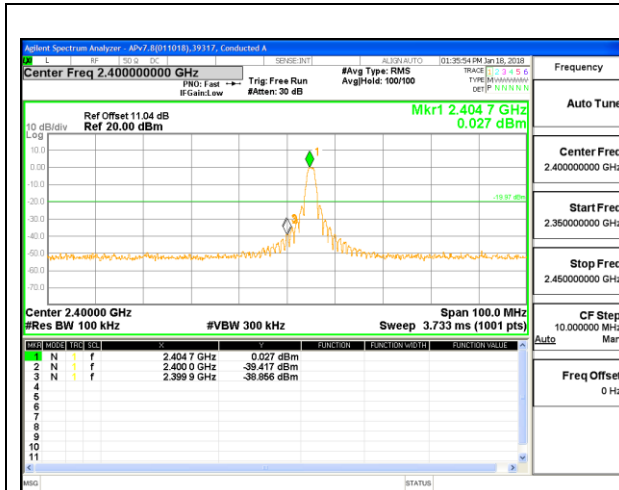
### LIMITS

FCC §15.247 (d)

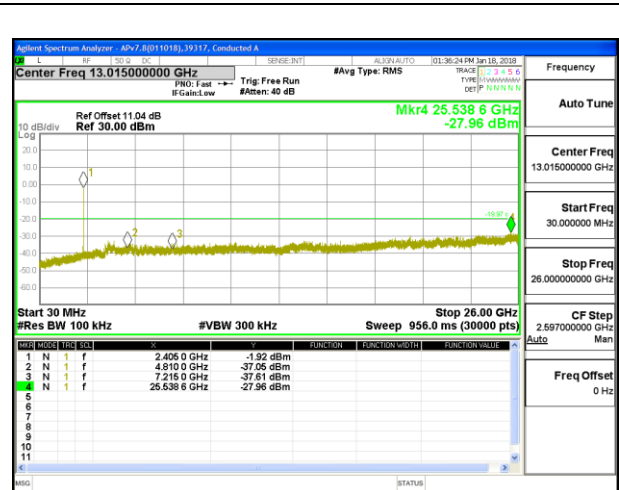
RSS-247 5.5

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

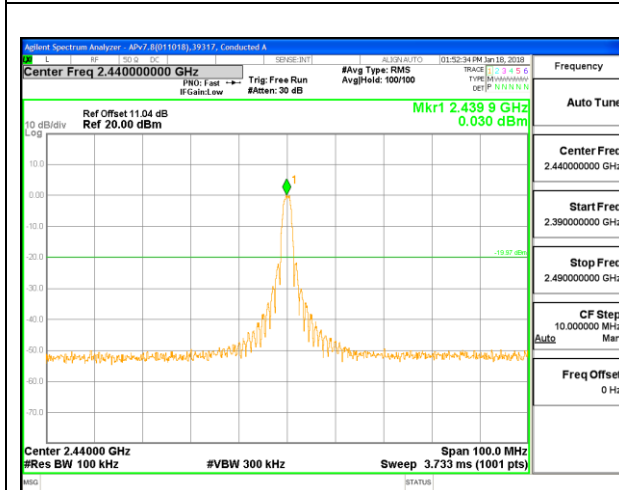
**RESULTS**



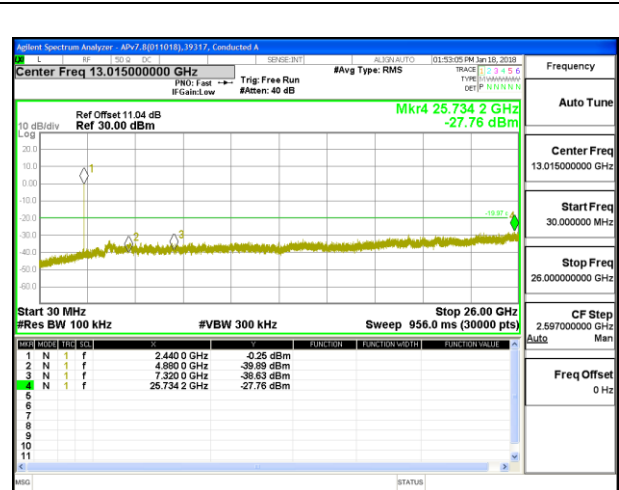
**LOW CHANNEL 11 BANDEDGE**



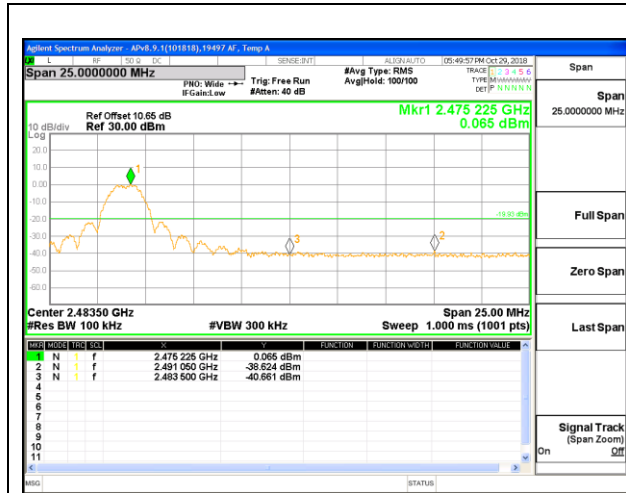
**OUT-OF-BAND LOW CHANNEL 11**



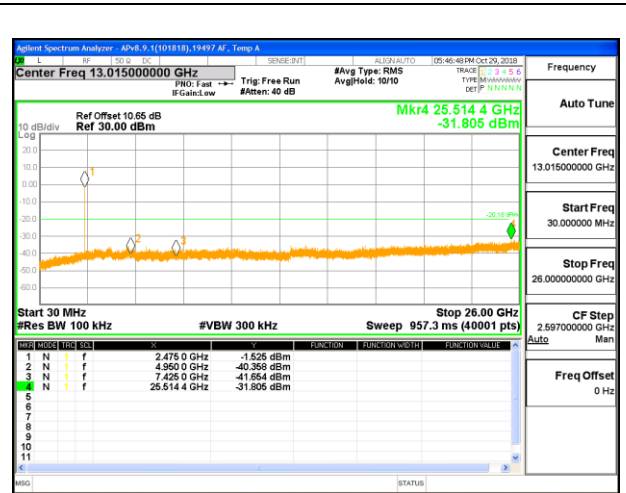
**IN-BAND REFERNECE LEVEL**



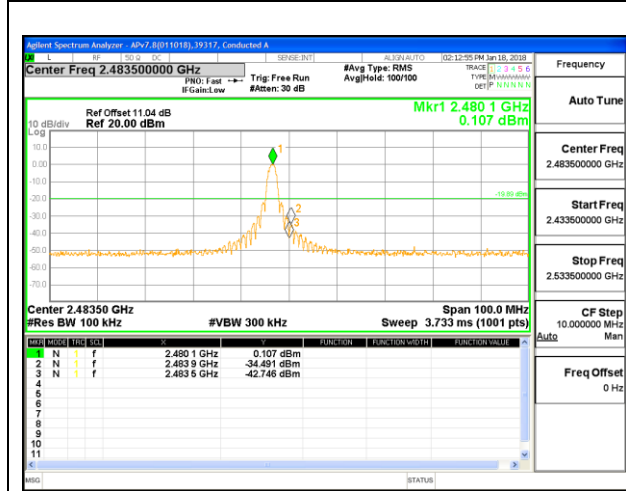
**OUT-OF-BAND MID CHANNEL 18**



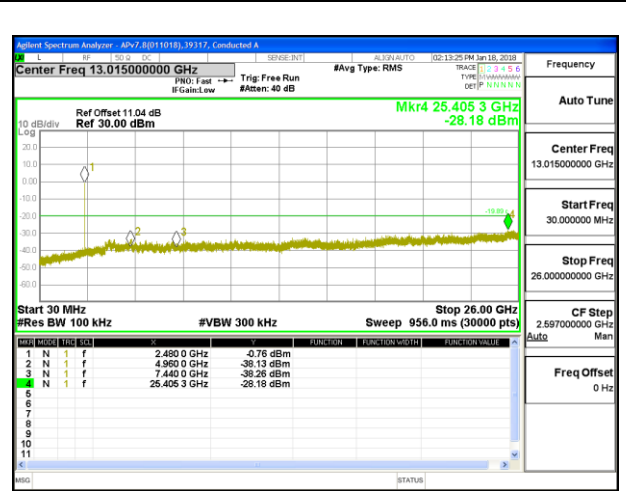
**HIGH CHANNEL 25 BANDEDGE**



**OUT-OF-BAND HIGH CHANNEL 25**



**HIGH CHANNEL 26 BANDEDGE**



**OUT-OF-BAND HIGH CHANNEL 26**

## 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 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.

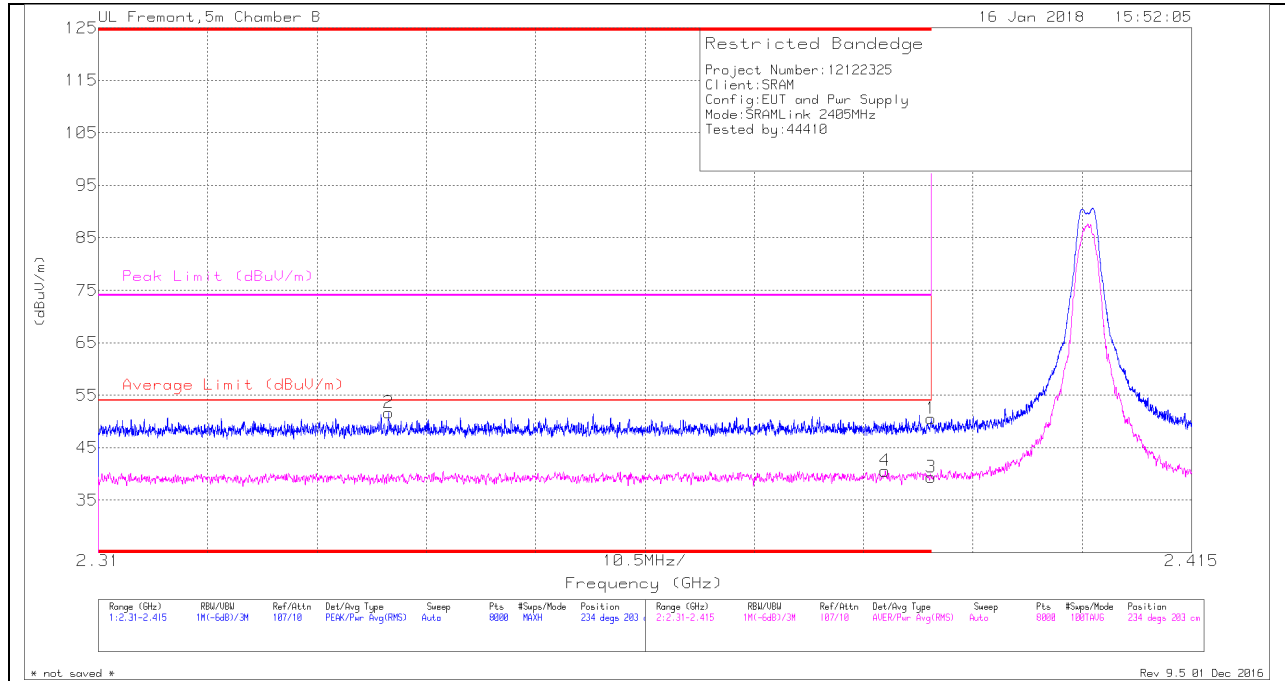
The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

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.

## 9.1. TRANSMITTER ABOVE 1 GHz

### BANDEDGE (LOW CHANNEL, CH 11)

#### HORIZONTAL RESULT



#### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (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	* 2.39	38.92	Pk	32.1	-20.5	50.52	-	-	74	-23.48	234	203	H
2	* 2.338	40.26	Pk	32	-20.6	51.66	-	-	74	-22.34	234	203	H
3	* 2.39	27.71	RMS	32.1	-20.5	39.31	54	-14.69	-	-	234	203	H
4	* 2.386	28.95	RMS	32.1	-20.5	40.55	54	-13.45	-	-	234	203	H

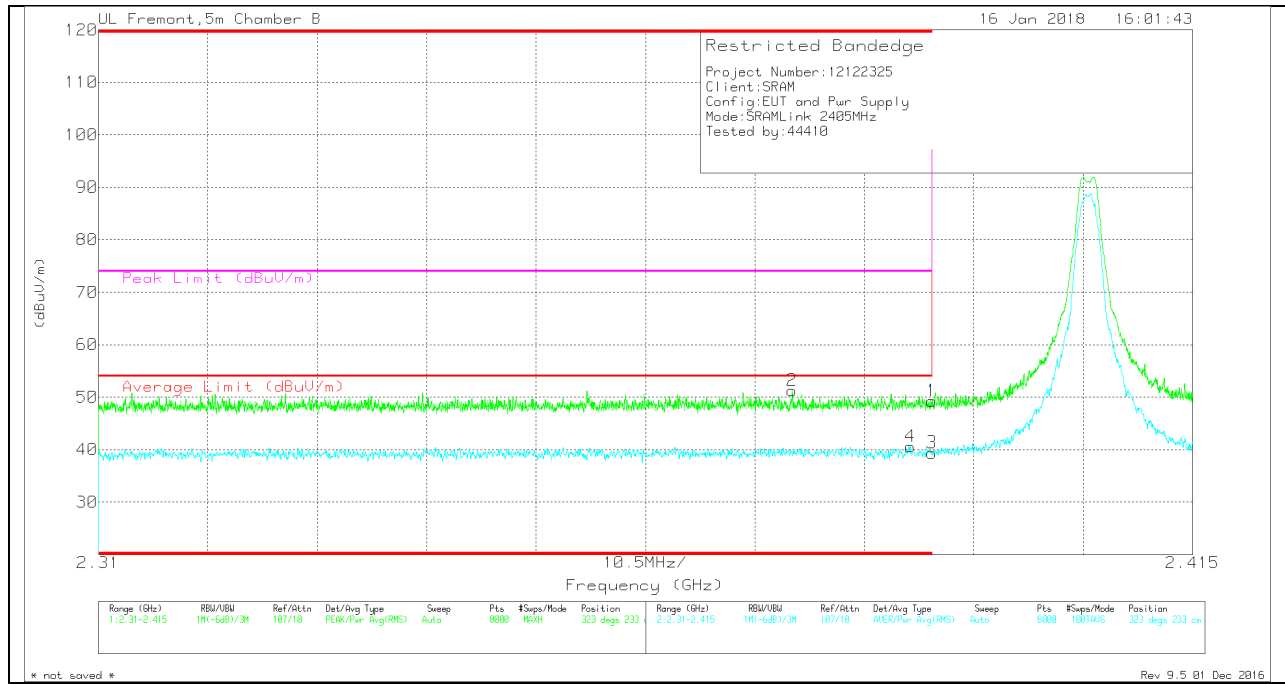
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection



### VERTICAL RESULT



### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cb/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	* 2.39	37.69	Pk	32.1	-20.5	49.29	-	-	74	-24.71	323	233	V
2	* 2.377	39.6	Pk	32.1	-20.4	51.3	-	-	74	-22.7	323	233	V
3	* 2.39	27.79	RMS	32.1	-20.5	39.39	54	-14.61	-	-	323	233	V
4	* 2.388	28.98	RMS	32.1	-20.5	40.58	54	-13.42	-	-	323	233	V

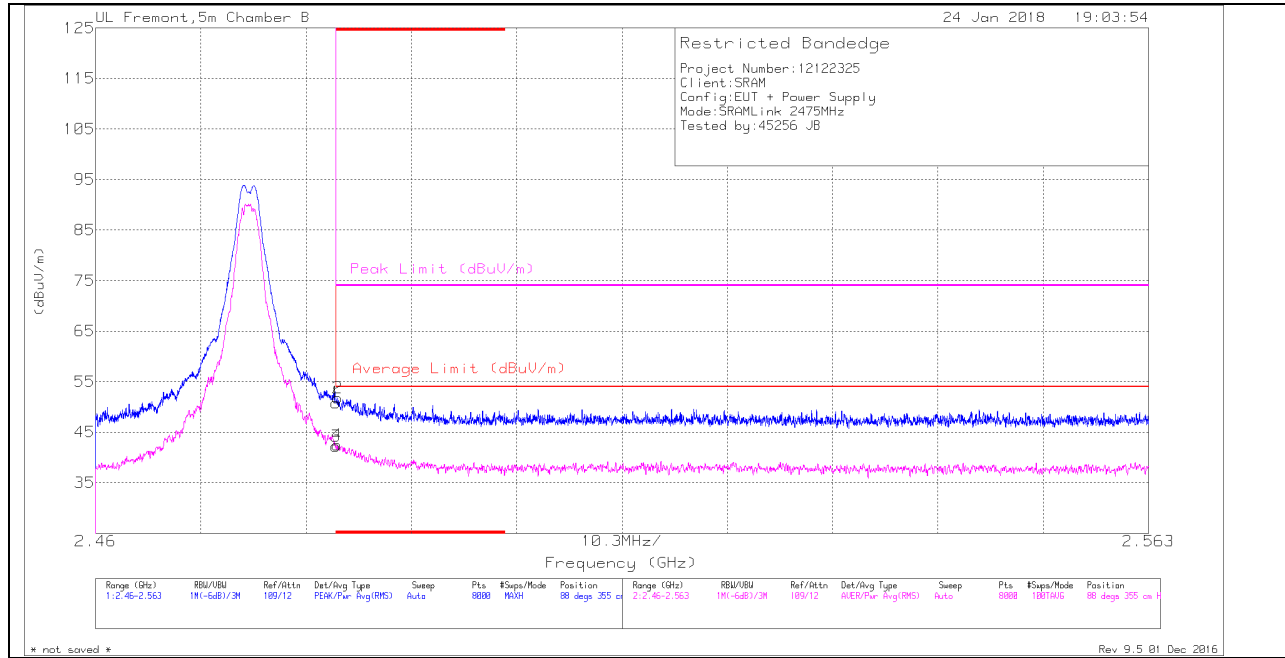
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## BANEDGE (HIGH CHANNEL, CH 25)

### HORIZONTAL RESULT



### Trace Markers

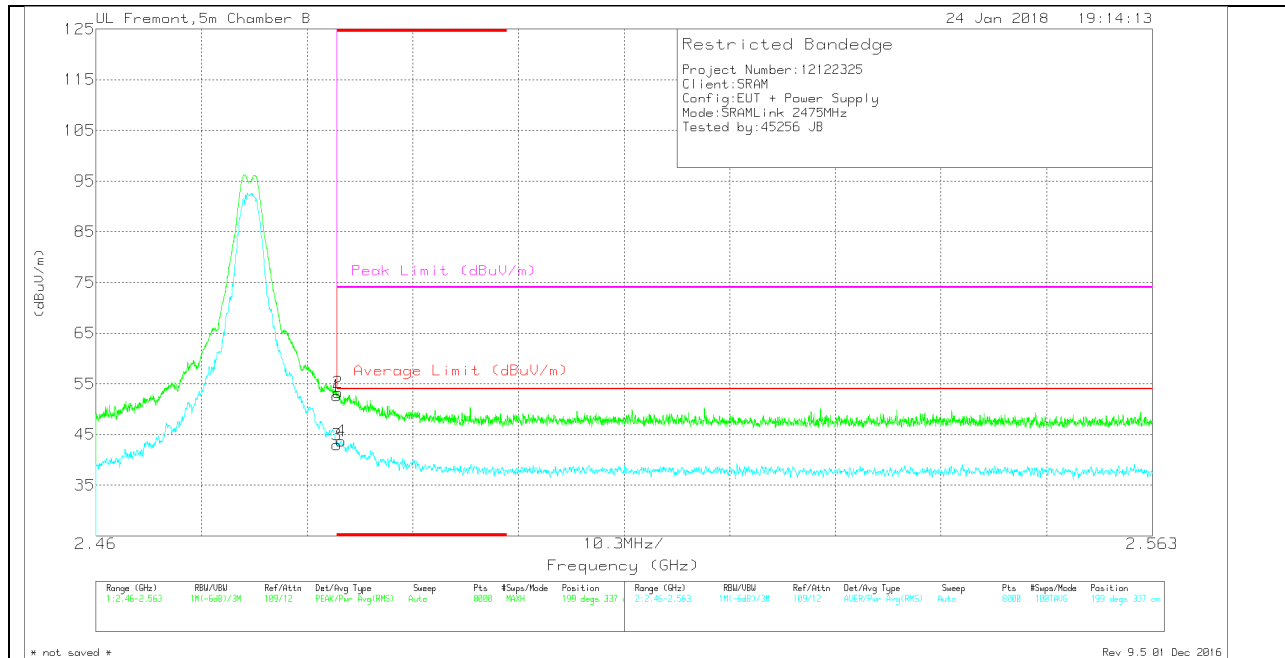
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	39.65	Pk	32.5	-21.3	50.85	-	-	74	-23.15	88	355	H
2	* 2.484	40.59	Pk	32.5	-21.3	51.79	-	-	74	-22.21	88	355	H
3	* 2.484	31.02	RMS	32.5	-21.3	42.22	54	-11.78	-	-	88	355	H
4	* 2.484	31.28	RMS	32.5	-21.3	42.48	54	-11.52	-	-	88	355	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 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	* 2.484	41.48	Pk	32.5	-21.3	52.68	-	-	74	-21.32	199	337	V
2	* 2.484	42.06	Pk	32.5	-21.3	53.26	-	-	74	-20.74	199	337	V
3	* 2.484	31.75	RMS	32.5	-21.3	42.95	54	-11.05	-	-	199	337	V
4	* 2.484	32.55	RMS	32.5	-21.3	43.75	54	-10.25	-	-	199	337	V

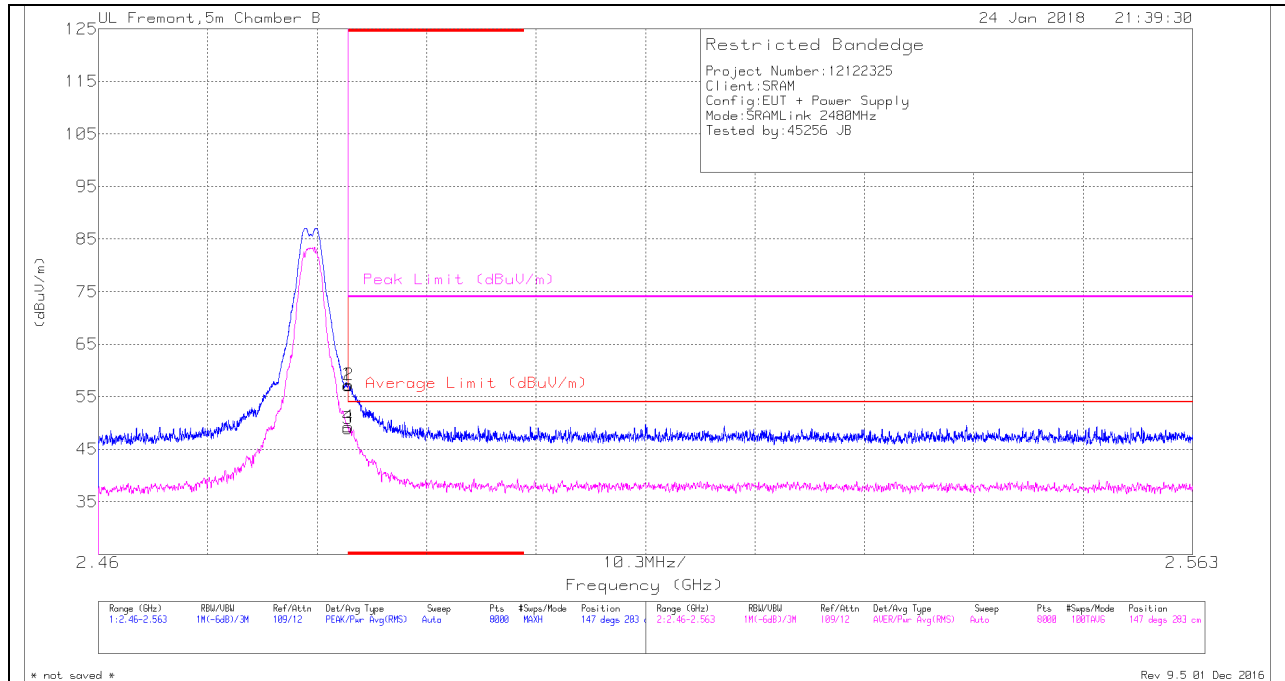
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

## BANDEDGE (HIGH CHANNEL, CH 26)

### HORIZONTAL RESULT



### Trace Markers

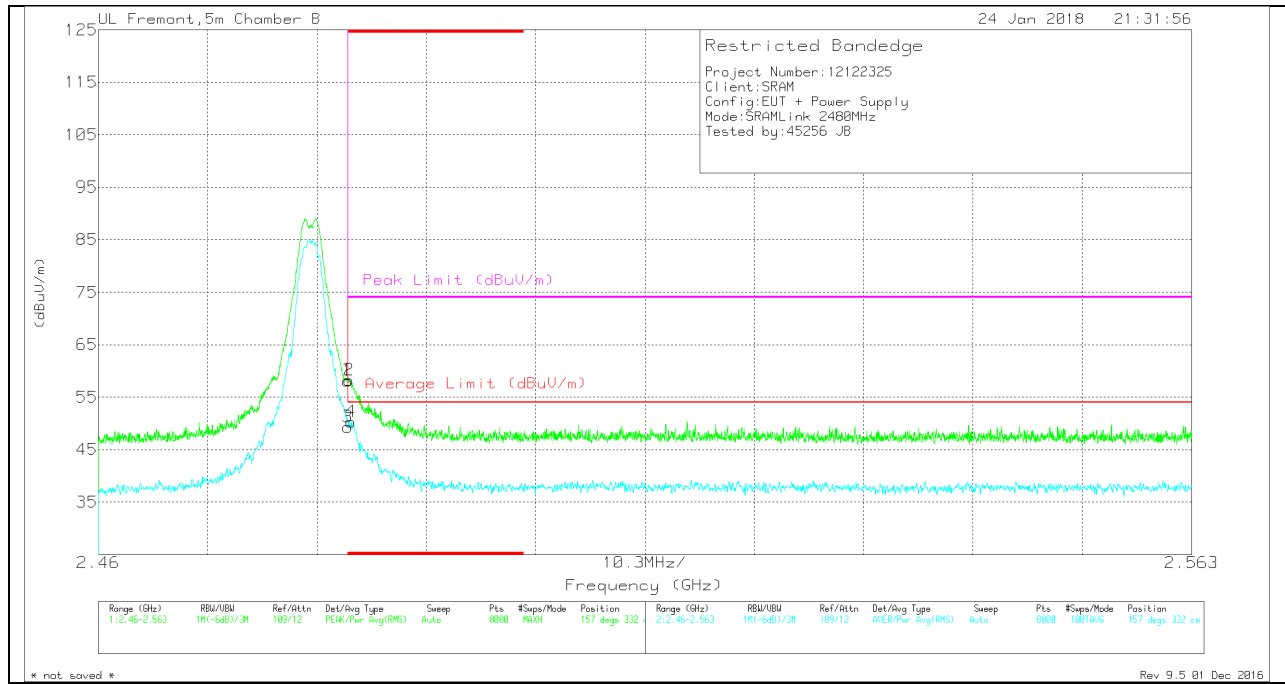
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbi/Fitr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	45.98	Pk	32.5	-21.3	57.18	-	-	74	-16.82	147	283	H
2	* 2.484	46.1	Pk	32.5	-21.3	57.3	-	-	74	-16.7	147	283	H
3	* 2.484	37.78	RMS	32.5	-21.3	48.98	54	-5.02	-	-	147	283	H
4	* 2.484	38.15	RMS	32.5	-21.3	49.35	54	-4.65	-	-	147	283	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 T863 (dB/m)	Amp/Cb/Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	46.94	Pk	32.5	-21.3	58.14	-	-	74	-15.86	157	332	V
2	* 2.484	47.04	Pk	32.5	-21.3	58.24	-	-	74	-15.76	157	332	V
3	* 2.484	38.05	RMS	32.5	-21.3	49.25	54	-4.75	-	-	157	332	V
4	* 2.484	39.08	RMS	32.5	-21.3	50.28	54	-3.72	-	-	157	332	V

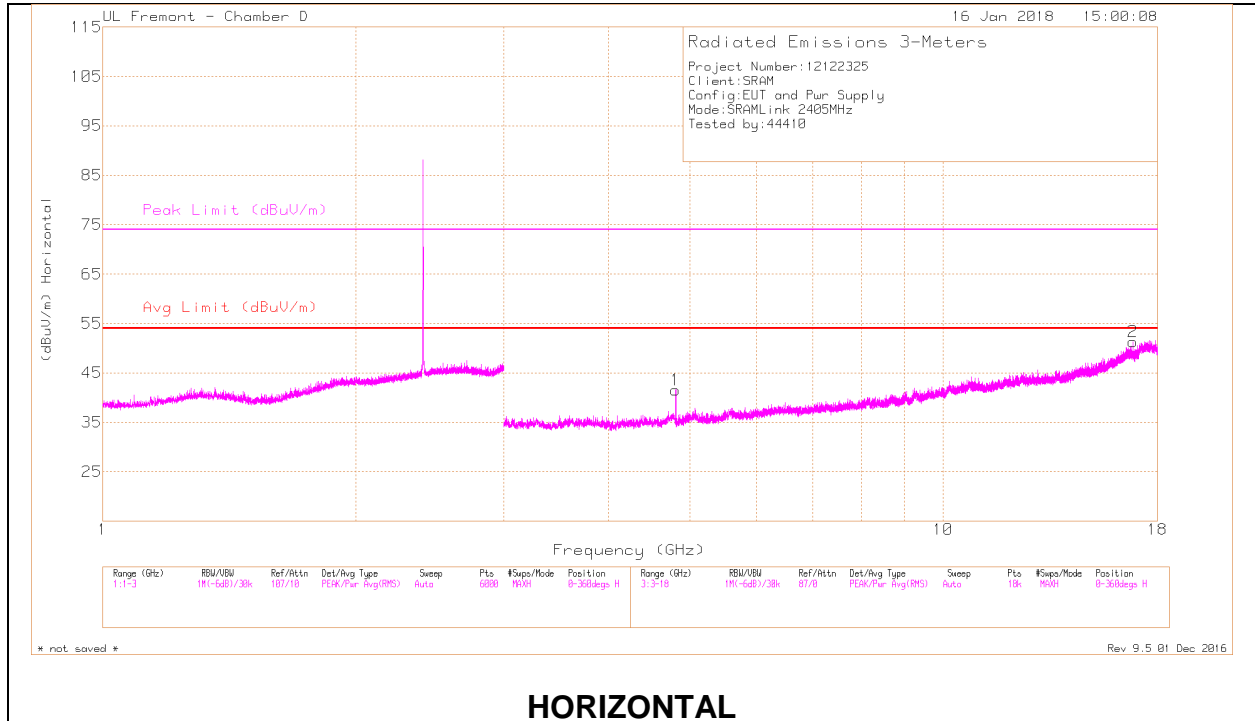
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

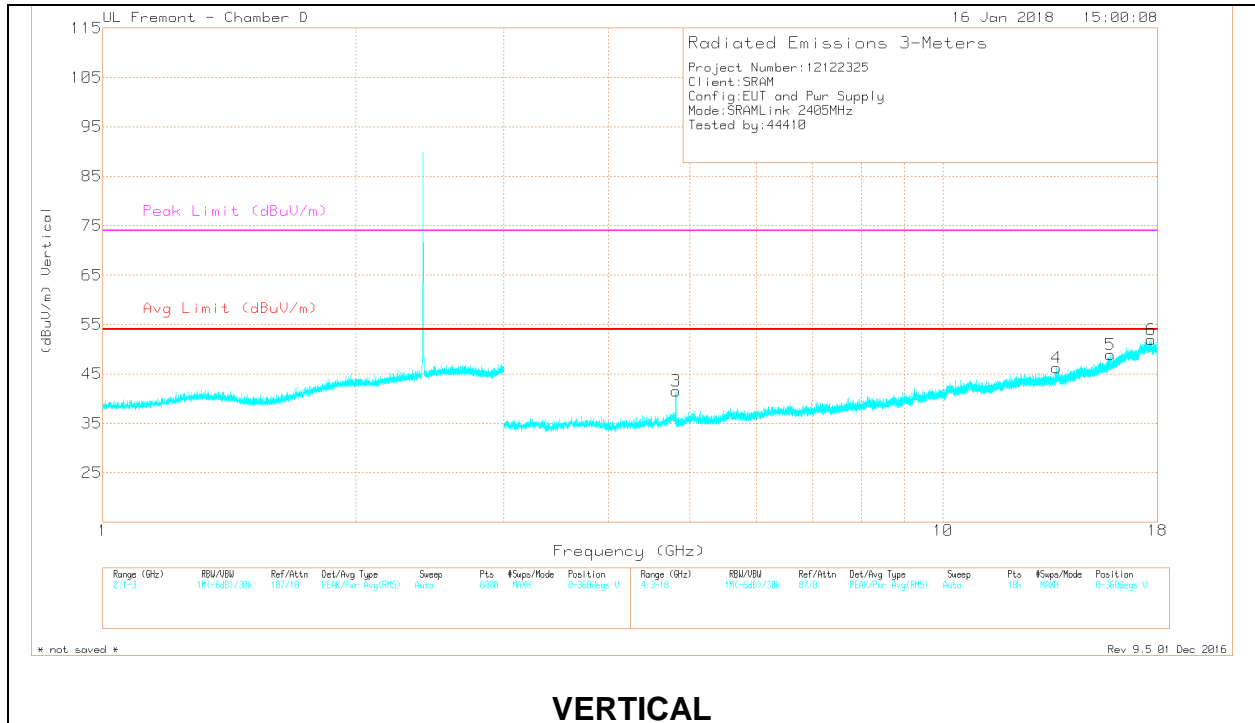
RMS - RMS detection

# HARMONICS AND SPURIOUS EMISSIONS

## LOW CHANNEL, CH 11 RESULTS



**HORIZONTAL**



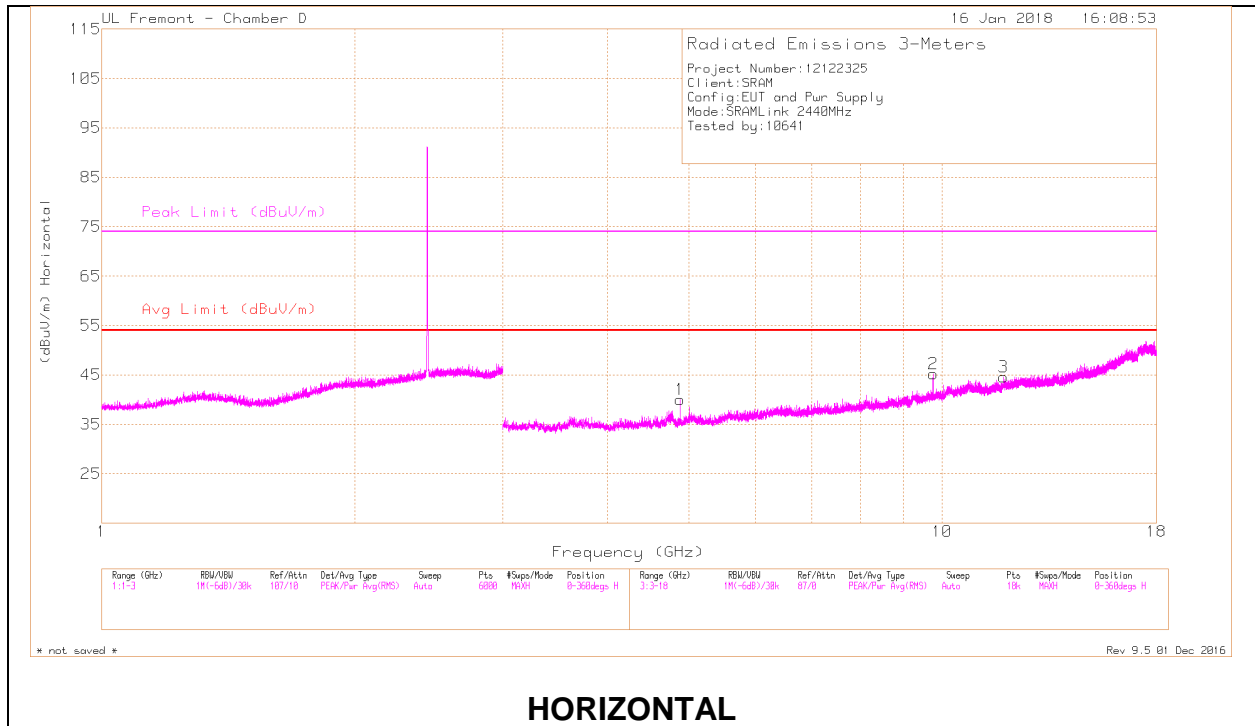
**VERTICAL**

**RADIATED EMISSIONS**

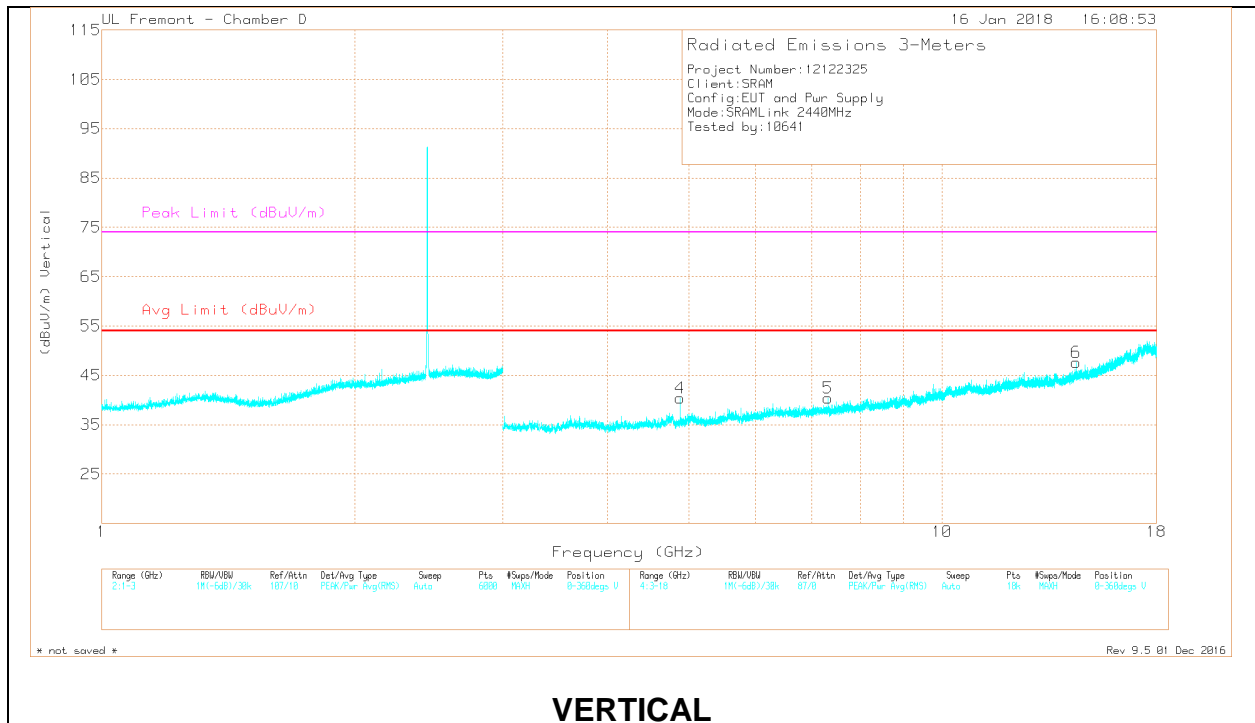
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cb/Filtr/P ad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.809	42.66	PK2	34	-26.5	50.16	-	-	74	-23.84	262	221	H
	* 4.809	35.38	MAv1	34	-26.5	42.88	54	-11.12	-	-	262	221	H
3	* 4.811	41.37	PK2	34	-26.6	48.77	-	-	74	-25.23	315	221	V
	* 4.811	33.81	MAv1	34	-26.6	41.21	54	-12.79	-	-	315	221	V
5	* 15.816	33.05	PK2	40.5	-18.5	55.05	-	-	74	-18.95	103	103	V
	* 15.816	20.72	MAv1	40.5	-18.5	42.72	54	-11.28	-	-	103	103	V
4	13.656	33.56	PK2	38.7	-21.3	50.96	-	-	74	-23.04	195	263	V
2	16.819	31.48	PK2	41.6	-17	56.08	-	-	74	-17.92	308	207	H
6	17.683	32.03	PK2	41.7	-15.3	58.43	-	-	74	-15.57	20	178	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, CH 18 RESULTS



**HORIZONTAL**



**VERTICAL**



**RADIATED EMISSIONS**

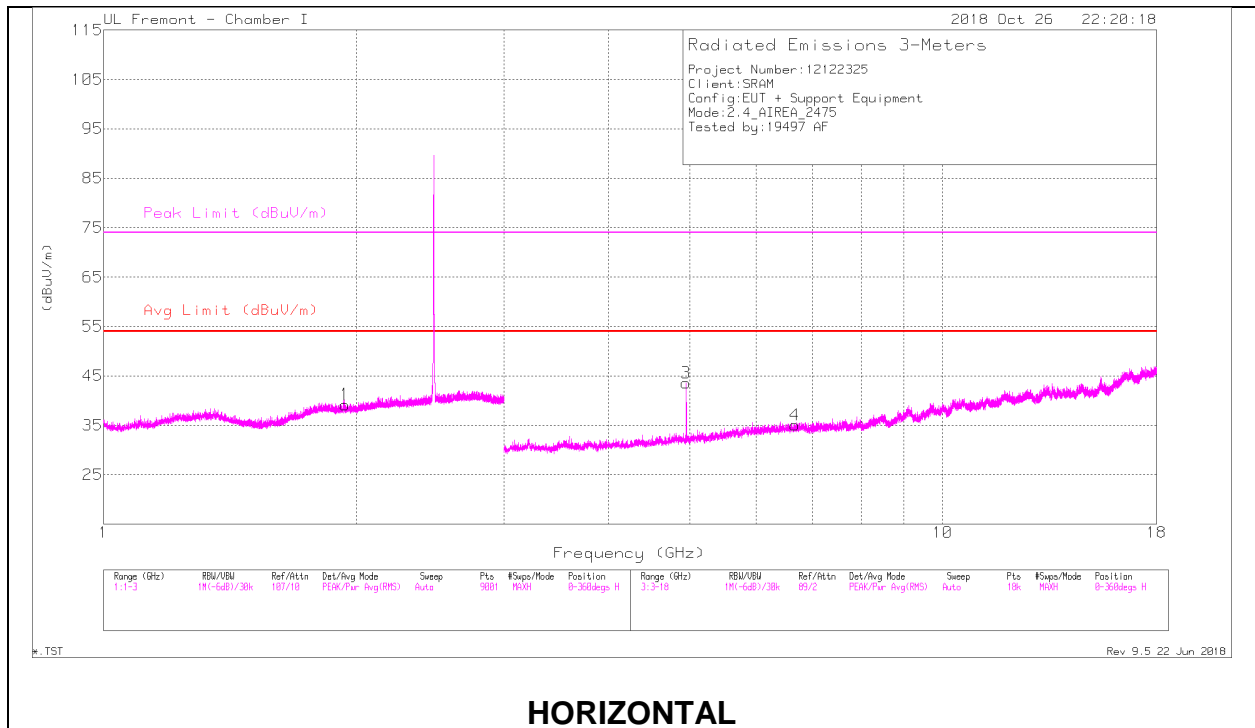
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T711 (dB/m)	Amp/Cb/Filtr/P ad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 4.881	40.04	PK2	34	-27.7	46.34	-	-	74	-27.66	239	250	H
	* 4.881	31.71	MAv1	34	-27.7	38.01	54	-15.99	-	-	239	250	H
3	* 11.83	31.46	PK2	38.5	-19.9	50.06	-	-	74	-23.94	0	259	H
	* 11.83	20.76	MAv1	38.5	-19.9	39.36	54	-14.04	-	-	0	259	H
4	* 4.881	40.4	PK2	34	-27.7	46.7	-	-	74	-27.3	288	235	V
	* 4.881	31.21	MAv1	34	-27.7	37.51	54	-16.49	-	-	288	235	V
5	* 7.318	34.67	PK2	35.5	-24.7	45.47	-	-	74	-28.53	288	235	V
	* 7.318	23.94	MAv1	35.5	-24.7	34.74	54	-19.26	-	-	288	235	V
2	9.758	36.3	PK2	36.8	-21.3	51.8	-	-	74	-22.2	0	259	H
6	14.451	33.51	PK2	39.6	-20.8	52.31	-	-	74	-21.69	288	235	V

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

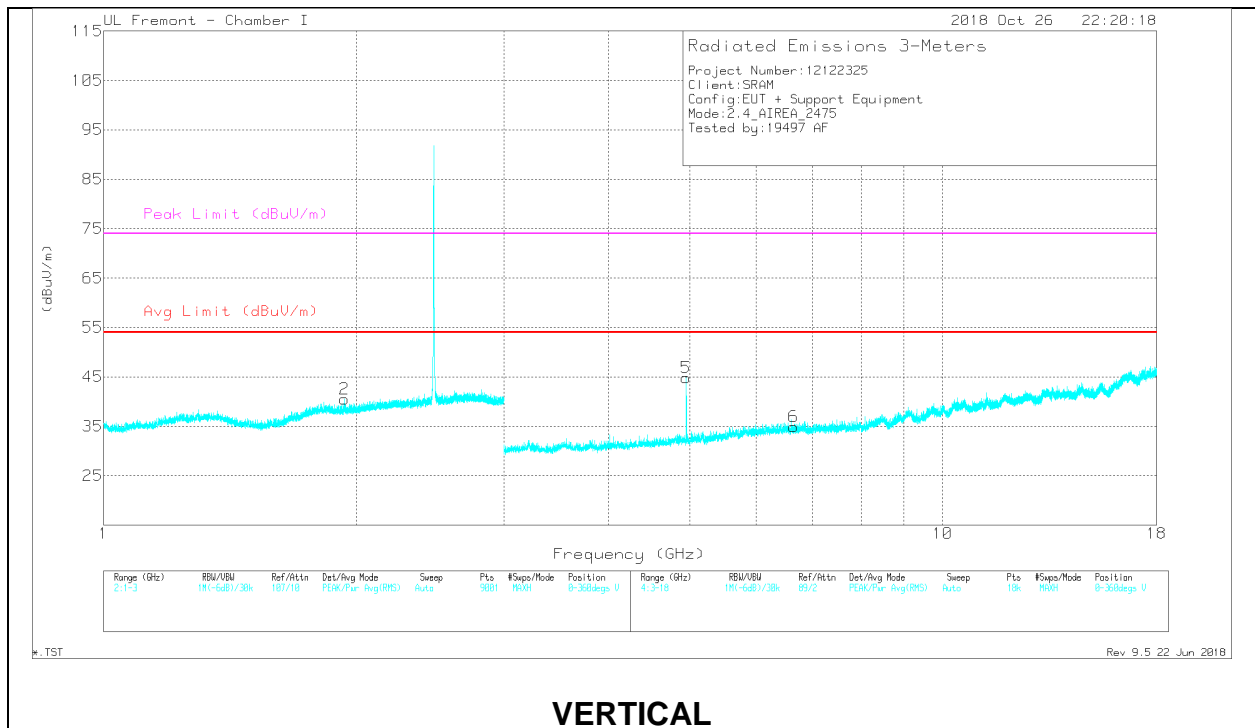
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

### HIGH CHANNEL, CH 25 RESULTS



**HORIZONTAL**



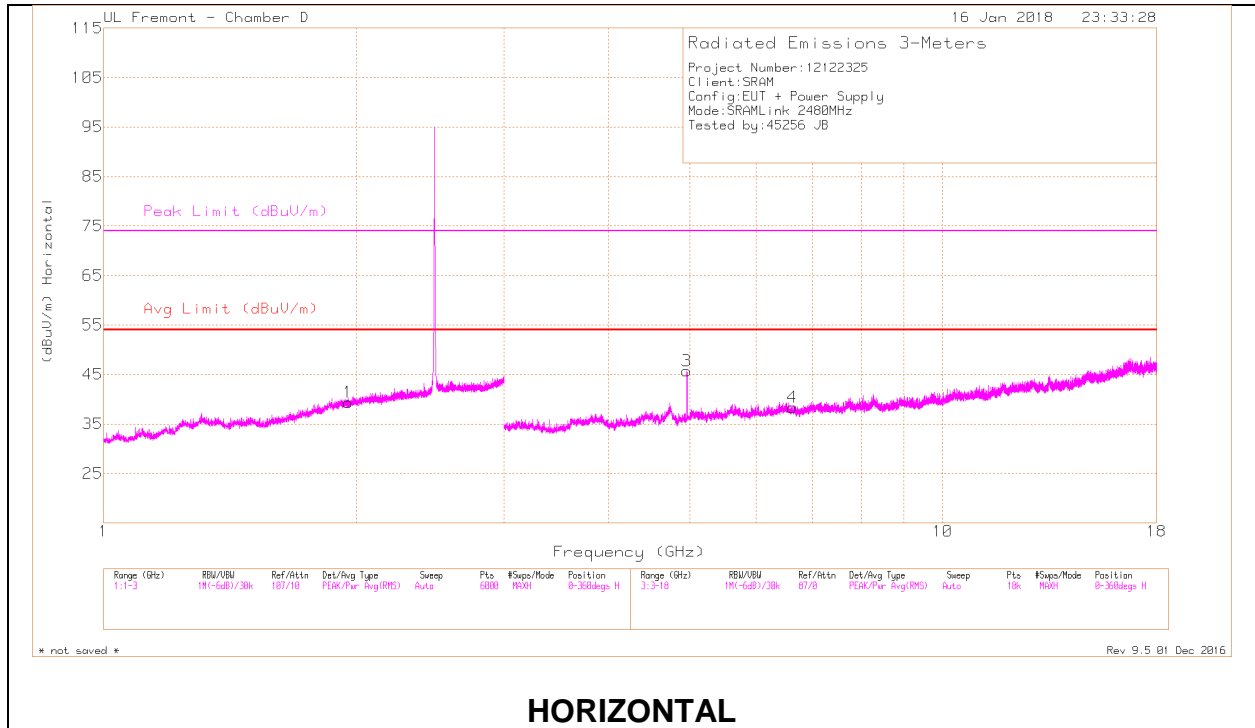
**VERTICAL**

**RADIATED EMISSIONS**

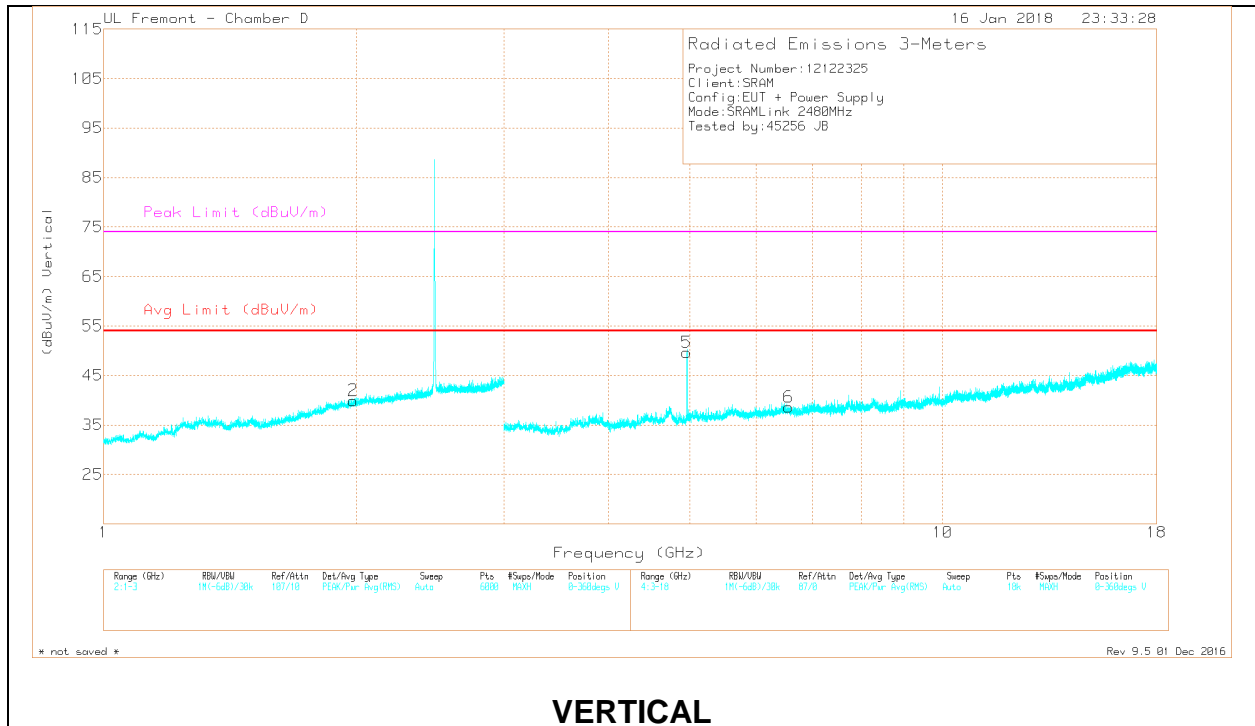
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.94	37.37	PK2	30.7	-22.5	45.57	-	-	-	-	349	129	H
2	1.937	37.43	PK2	30.7	-22.5	45.63	-	-	-	-	7	305	V
3	* 4.951	43.63	PK2	34.2	-29.1	48.73	-	-	74	-25.27	280	362	H
	* 4.951	37.07	MAv1	34.2	-29.1	42.17	54	-11.83	-	-	280	362	H
4	6.675	34.31	PK2	35.7	-26.8	43.21	-	-	-	-	63	157	H
5	* 4.951	45.83	PK2	34.2	-29.1	50.93	-	-	74	-23.07	280	110	V
	* 4.951	38.74	MAv1	34.2	-29.1	43.84	54	-10.16	-	-	280	110	V
6	6.652	32.76	PK2	35.7	-26.5	41.96	-	-	-	-	150	159	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, CH 26 RESULTS



### HORIZONTAL



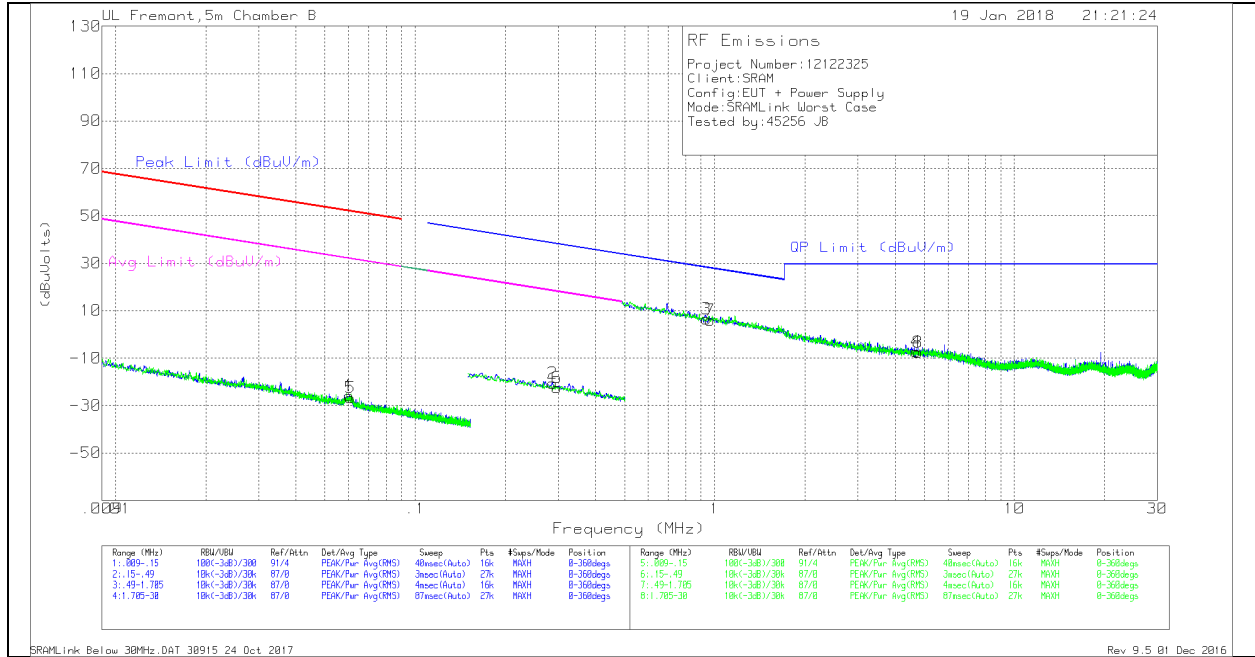
### VERTICAL

**RADIATED EMISSIONS**

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cb/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
3	* 4.959	47.25	PK2	34.4	-30.8	50.85	-	-	74	-23.15	1	377	H
	* 4.959	39.95	MAv1	34.4	-30.8	43.55	54	-10.45	-	-	1	377	H
5	* 4.959	50.19	PK2	34.4	-30.8	53.79	-	-	74	-20.21	252	182	V
	* 4.959	44.04	MAv1	34.4	-30.8	47.64	54	-6.36	-	-	252	182	V
1	1.957	35.65	PK2	31.1	-21.1	45.65	-	-	-	-	153	341	H
2	1.985	35.9	PK2	31.2	-21.1	46	-	-	-	-	144	109	V
6	6.555	38.49	PK2	35.7	-29.1	45.09	-	-	-	-	85	339	V
4	6.628	38.34	PK2	35.7	-29.3	44.74	-	-	-	-	210	100	H

\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band  
 PK2 - KDB558074 Method: Maximum Peak  
 MAv1 - KDB558074 Option 1 Maximum RMS Average

### 9.2. Worst Case Below 30MHz



**NOTE: KDB 414788 OATS and Chamber Correlation Justification**

- Based on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
- OATs and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

**Below 30MHz DATA**

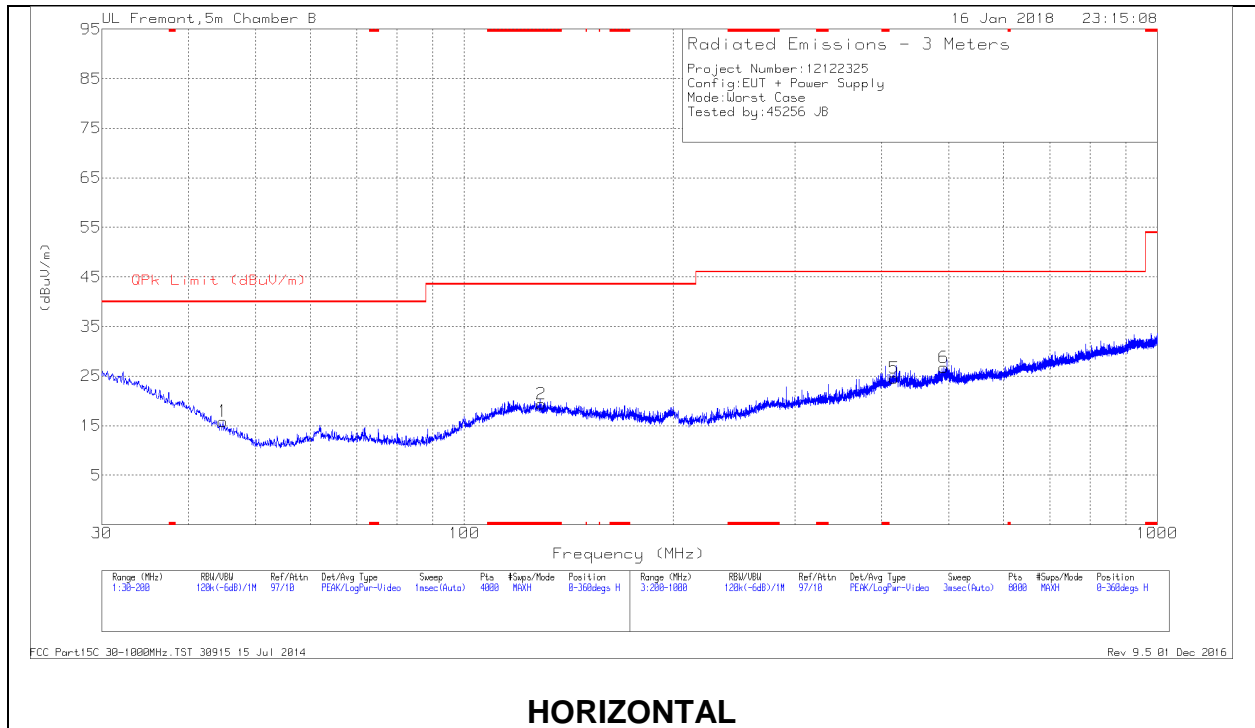
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.06019	38.06	Pk	14.5	1.4	-80	-26.04	51.99	-78.03	31.99	-58.03	-	-	-	-	0-360
5	.06082	37.44	Pk	14.5	1.4	-80	-26.66	51.9	-78.56	31.9	-58.56	-	-	-	-	0-360
2	.28749	44.13	Pk	13.8	1.5	-80	-20.57	-	-	-	-	38.44	-59.01	18.44	-39.01	0-360
6	.29739	42.25	Pk	13.8	1.5	-80	-22.45	-	-	-	-	38.15	-60.6	18.15	-40.6	0-360

**Pk - Peak detector**

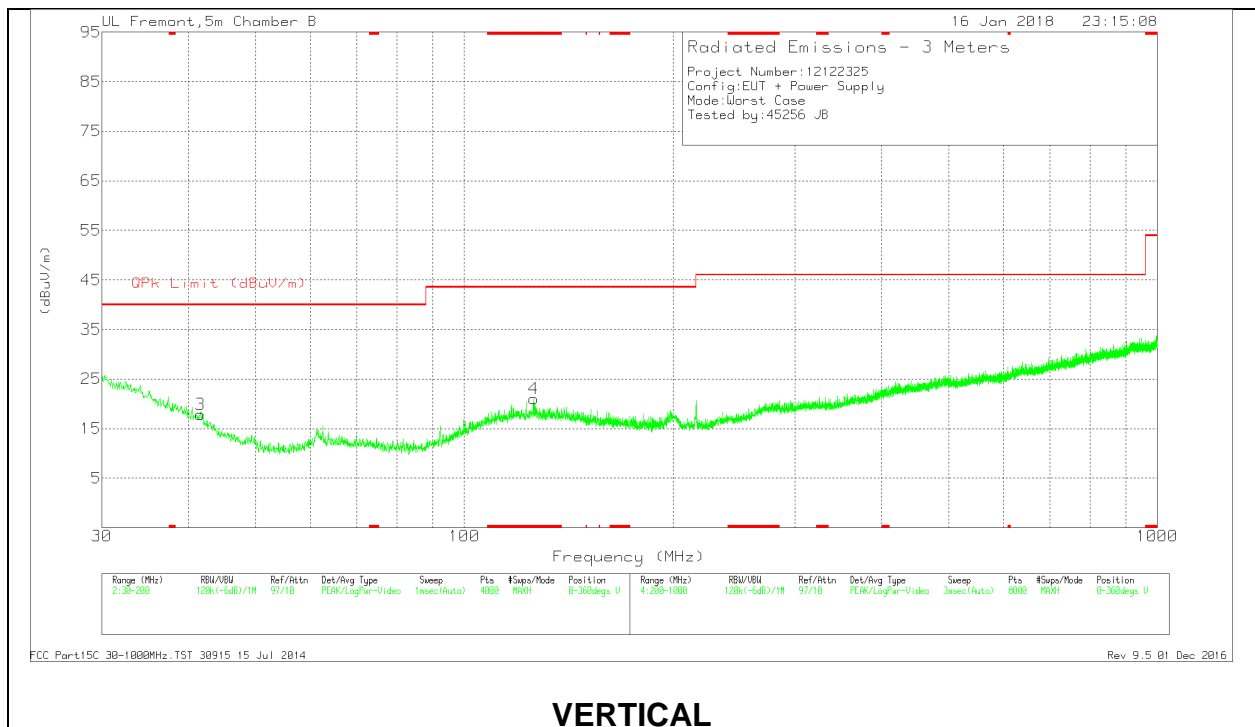
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.93749	30.77	Pk	14.2	1.5	-40	6.47	28.18	-21.71	0-360
7	.965	30.26	Pk	14.2	1.5	-40	5.96	27.93	-21.97	0-360
4	4.69809	16.85	Pk	14.4	1.5	-40	-7.25	29.5	-36.75	0-360
8	4.76306	16.54	Pk	14.4	1.5	-40	-7.56	29.5	-37.06	0-360

**Pk - Peak detector**

### 9.3. Worst Case Below 1 GHz



**HORIZONTAL**



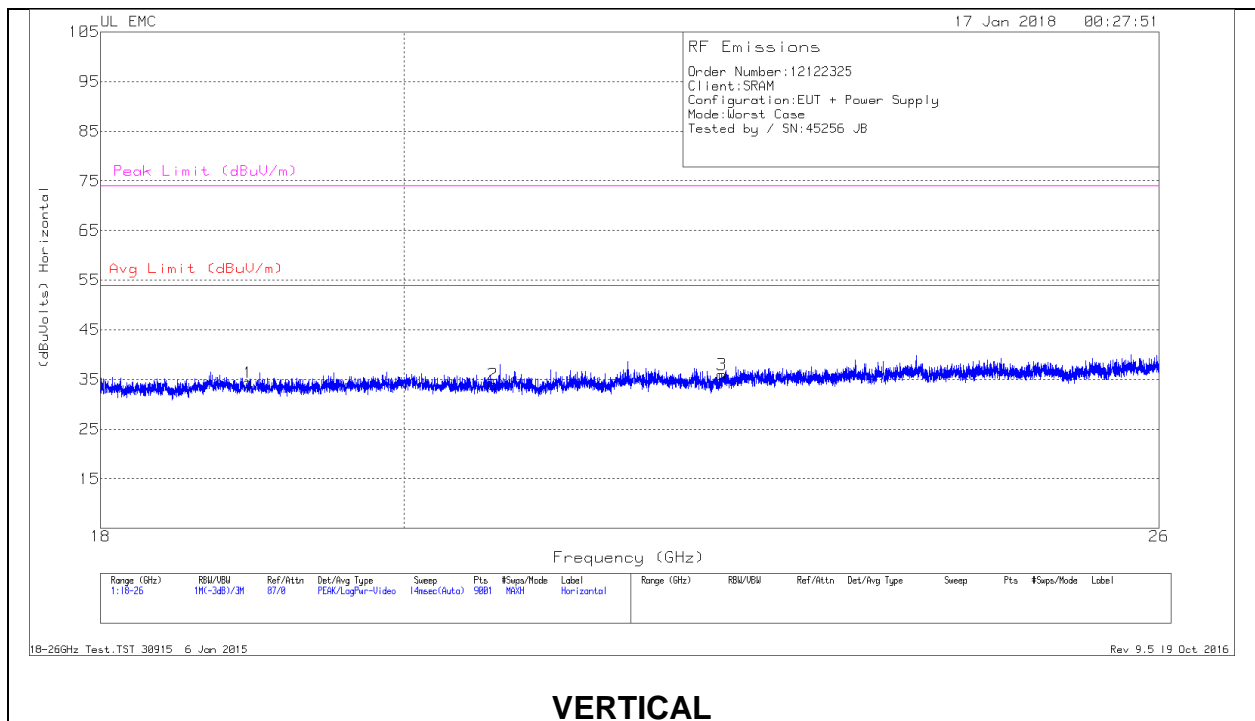
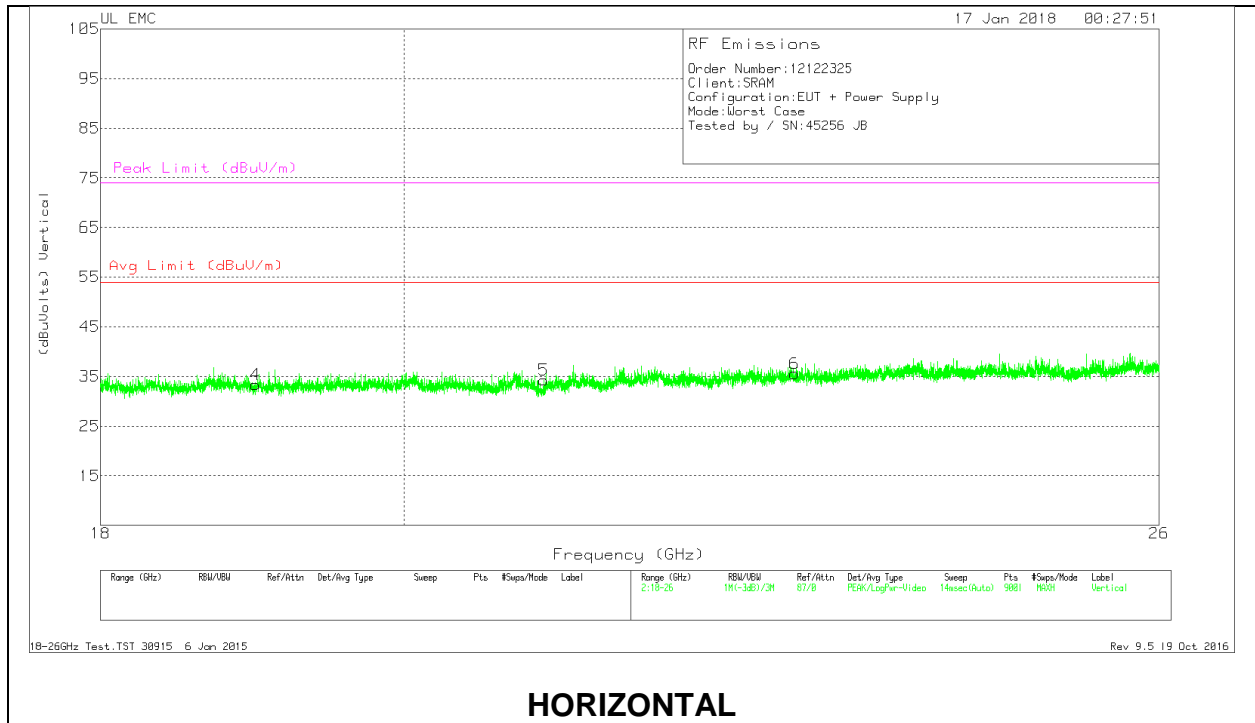
**VERTICAL**



**Below 1GHz DATA**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T899 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 129.2207	29.29	Pk	17.7	-27.6	19.39	43.52	-24.13	0-360	100	H
4	* 125.9048	30.91	Pk	17.7	-27.6	21.01	43.52	-22.51	0-360	100	V
3	41.6055	29.52	Pk	17	-28.7	17.82	40	-22.18	0-360	100	V
1	44.8363	30.09	Pk	14.4	-28.6	15.89	40	-24.11	0-360	100	H
5	417.3282	30.38	Pk	20.2	-26	24.58	46.02	-21.44	0-360	200	H
6	492.238	31.09	Pk	21.6	-25.9	26.79	46.02	-19.23	0-360	200	H

### 9.4. Worst Case 18-26 GHz



**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)	PK Margin (dB)
1	18.947	36.54	Pk	32.2	-24.9	-9.5	34.34	54	-19.66	74	-39.66
2	20.628	36.31	Pk	32.7	-25.5	-9.5	34.01	54	-19.99	74	-39.99
3	22.335	37.39	Pk	32.9	-24.8	-9.5	35.99	54	-18.01	74	-38.01
4	18.996	35.61	Pk	32.1	-24.9	-9.5	33.31	54	-20.69	74	-40.69
5	20.996	37.05	Pk	32.4	-25.7	-9.5	34.25	54	-19.75	74	-39.75
6	22.906	36.85	Pk	33.4	-25.2	-9.5	35.55	54	-18.45	74	-38.45