



CERTIFICATION TEST REPORT

Report Number. : 12292162-E2V3

Applicant : SRAM LLC
1000 W Fulton Market 4th Floor
Chicago, IL 60607 U.S.A

Model : 00210

FCC ID : C90-BOXB1

IC : 10161A-BOXB1

EUT Description : Universal 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:

July 24, 2018

Prepared by:

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	6/15/2018	Initial Issue	--
V2	6/27/2018	Updated Section 5.3	Steven Tran
V3	7/24/2018	Updated Section 7, 8.2, 8.3, 8.6, 8.7, and 9.1	Steven Tran

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SRAM LLC
1000 W Fulton Market, 4th Floor
Chicago, IL 60607, U.S.A

EUT DESCRIPTION: Universal Shifter with AIREA and BLE Radios

MODEL: 00210

SERIAL NUMBER: 1154040031 (Conducted), 1154040036 (Radiated)

DATE TESTED: May 18-25; July 19-24, 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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DAN CORONIA
CONSUMER TECHNOLOGY DIVISION
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UL Verification Services Inc.

Prepared By:



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TEST 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 v04, 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, 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
☒ Chamber A (ISED:2324B-1)	☒ Chamber D (ISED:22541-1)
☒ Chamber B (ISED:2324B-2)	☐ Chamber E (ISED:22541-2)
☐ Chamber C (ISED:2324B-3)	☐ Chamber F (ISED:22541-3)
	☐ Chamber G (ISED:22541-4)
	☐ Chamber H (ISED:22541-5)

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

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://nist.gov/standards/scopes/2000650.htm>.

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 Universal Shifter with AIREA and BLE Radios, powered by CR2032, 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)
2405-2480	AIREA	5.05	3.20	4.8	3.02

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a chip antenna, Pulse W3008C, with a maximum gain of 2.2 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 X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

5.6. DESCRIPTION OF TEST SETUP

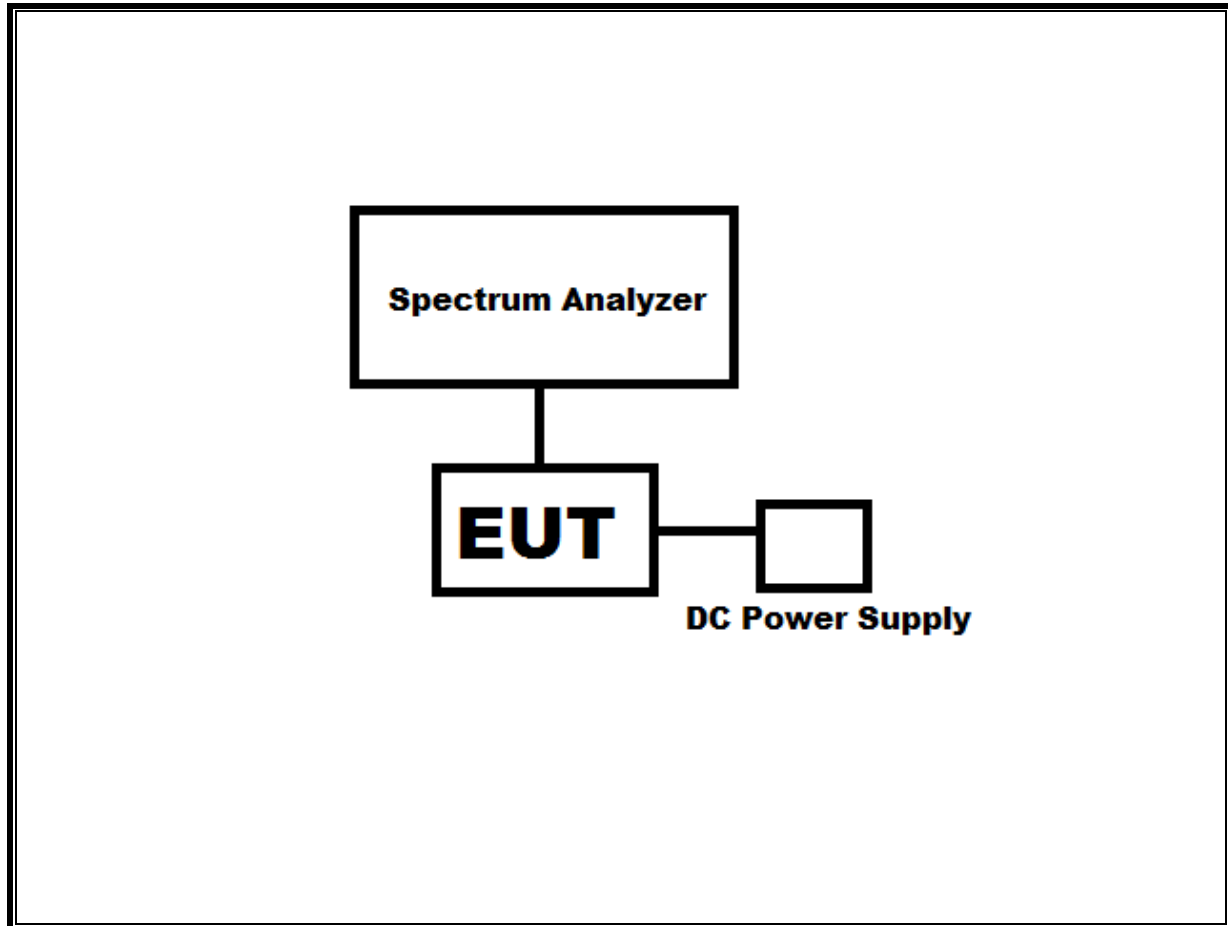
SUPPORT EQUIPMENT

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

TEST SETUP

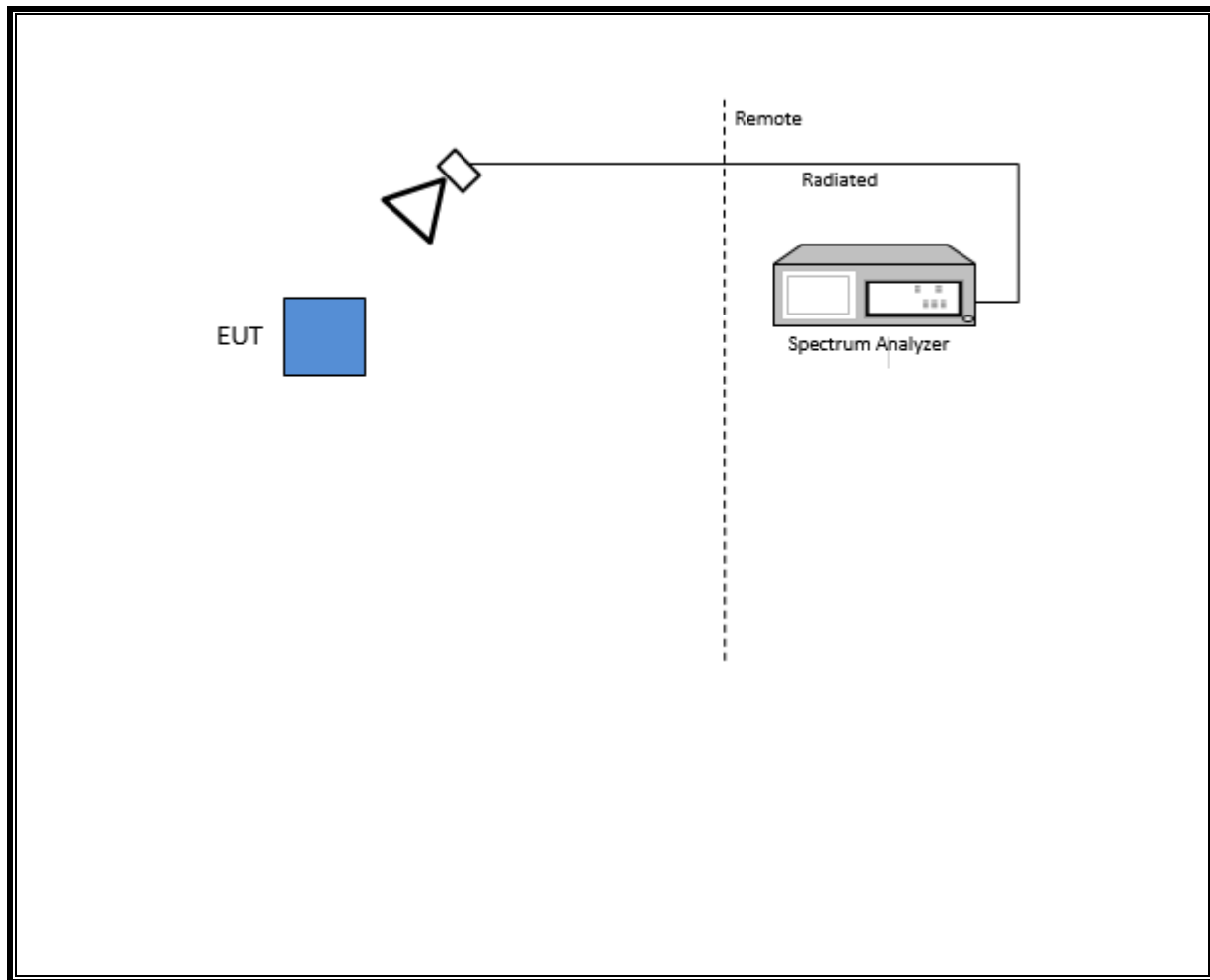
The EUT is powered by a CR2032 coin cell battery. The iPod Touch wirelessly sends commands to the EUT.

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 CR2032, coin cell battery.

SETUP DIAGRAM FOR RADIATED TESTS



6. MEASUREMENT METHOD

On Time and Duty Cycle: KDB 558074 D01 v04, Section 6.

6 dB BW: KDB 558074 D01 v04, Section 8.1.

99% BW: ANSI C63.10-2013, Section 6.9.3.

Output Power: KDB 558074 D01 v04, Section 9.2.3.2.

Power Spectral Density: KDB 558074 D01 v04, Section 10.2.

Out-of-band emissions in non-restricted bands: KDB 558074 D01 v04, Section 11.1 a).

Out-of-band emissions in restricted bands: KDB 558074 D01 v04, Section 12.1.

Band-edge: KDB 558074 D01 v04, Section 12.1.

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	T1454	01/08/18	01/08/19
Spectrum Analyzer	Agilent	N9030A	T1466	04/16/18	04/16/19
Antenna, Biconolog, 30MHz-2000MHz	Sunol Sciences	JB1	T130	10/16/17	10/16/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T862	06/09/17	06/09/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T136	07/02/18	07/02/19
RF Preamplifier, 10kHz - 1GHz	HP	8447D	T15	08/14/17	08/14/18
RF Preamplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T1165	11/25/17	11/25/18
RF Preamplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T493	04/03/18	04/03/19
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

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 8.2, Mar 21, 2018

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

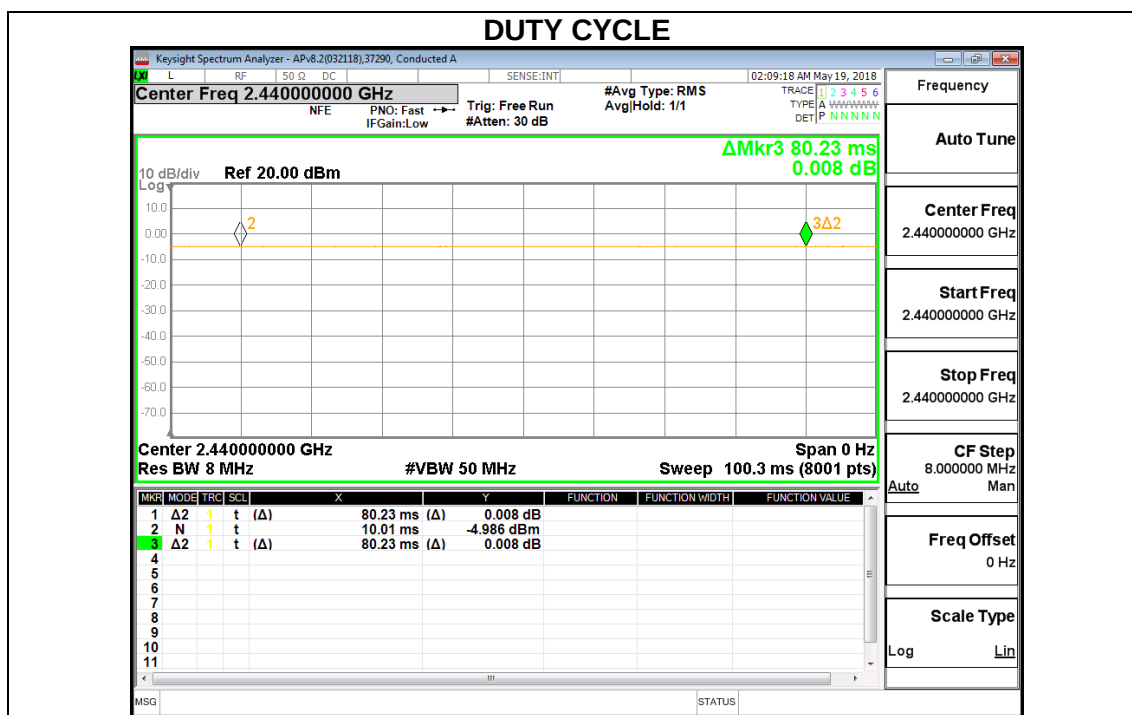
None; for reporting purposes only.

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)
AIREA	1.0	1.0	1.000	100.00%	0.00	0.010



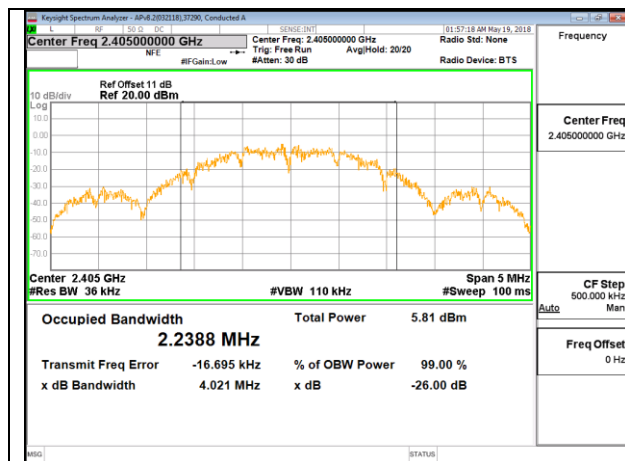
8.2. 99% BANDWIDTH

LIMITS

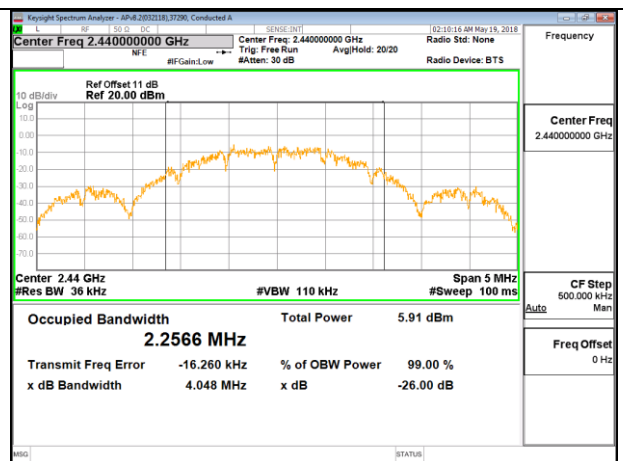
None; for reporting purposes only.

RESULTS

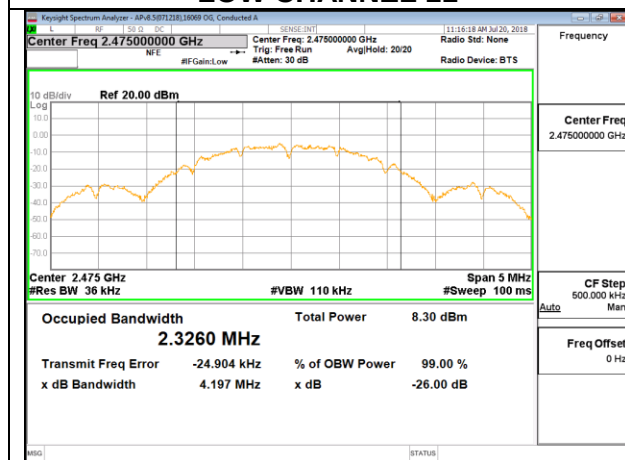
Channel	Frequency	99% Bandwidth
	(MHz)	(MHz)
Low 11	2405	2.2388
Mid 18	2440	2.2566
High 25	2475	2.3260
High 26	2480	2.3144



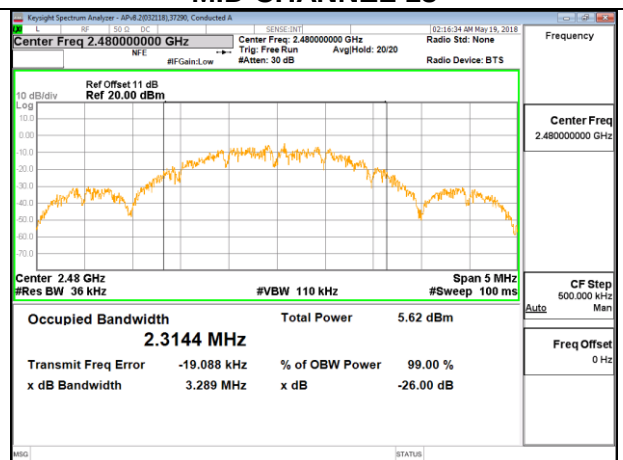
LOW CHANNEL 11



MID CHANNEL 18



HIGH CHANNEL 25



HIGH CHANNEL 26

8.3. 6 dB BANDWIDTH

LIMITS

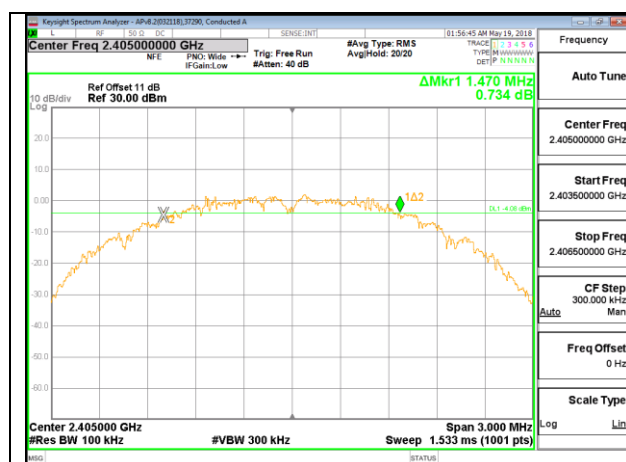
FCC §15.247 (a) (2)

RSS-247 5.2 (a)

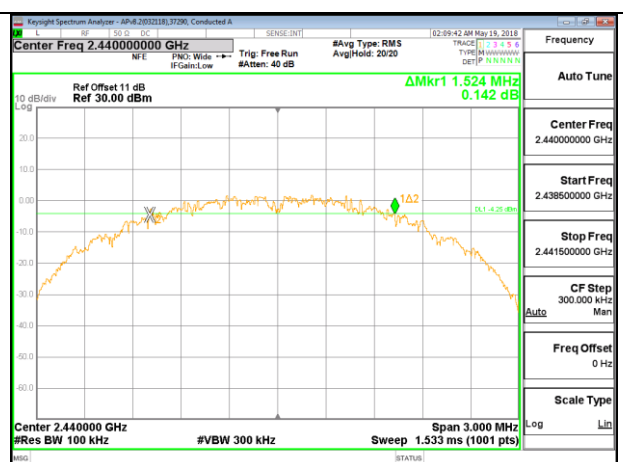
The minimum 6 dB bandwidth shall be at least 500 kHz.

RESULTS

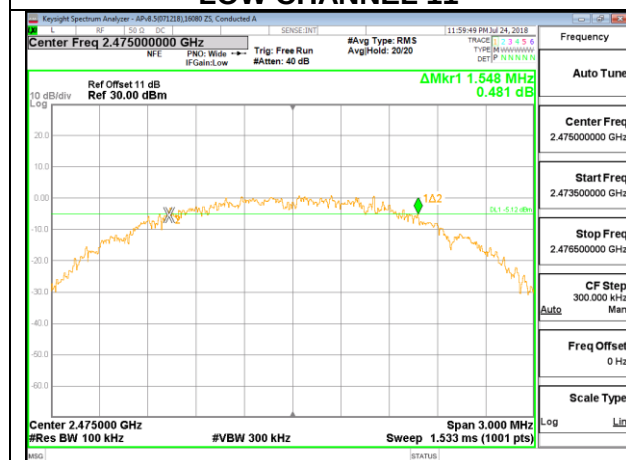
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low 11	2405	1.470	0.5
Mid 18	2440	1.524	0.5
High 25	2475	1.548	0.5
High 26	2480	1.410	0.5



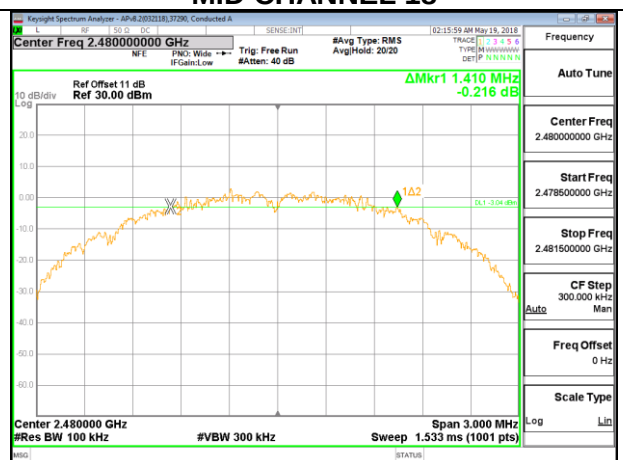
LOW CHANNEL 11



MID CHANNEL 18



HIGH CHANNEL 25



HIGH CHANNEL 26

8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

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

Tested By:	39005 RA
Date:	5/24/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low 11	2405	5.01	30	-24.99
Middle 18	2440	5.05	30	-24.95
High 25	2475	5.01	30	-24.99
High 26	2480	-2.38	30	-32.38

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

Tested By:	39005 RA
Date:	05/24/18

Channel	Frequency (MHz)	Meas Ave Power (dBm)
Low 11	2405	4.80
Mid 18	2440	4.80
High 25	2475	4.79
High 26	2480	-2.47

8.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

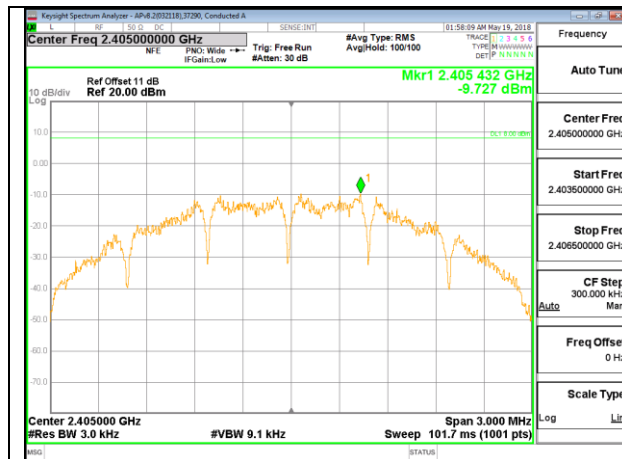
RSS-247 (5.2) (b)

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.

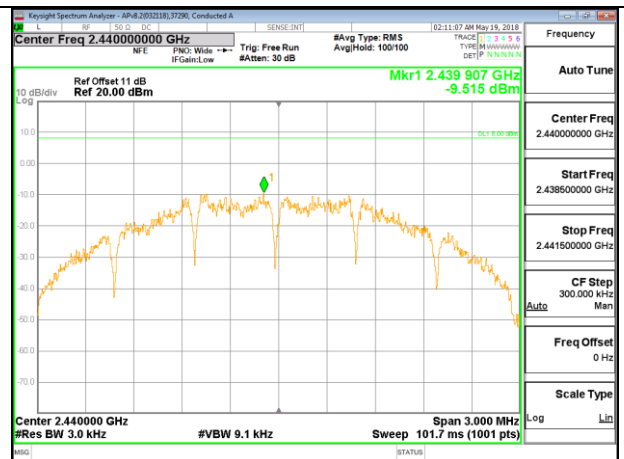
RESULTS

PSD Results

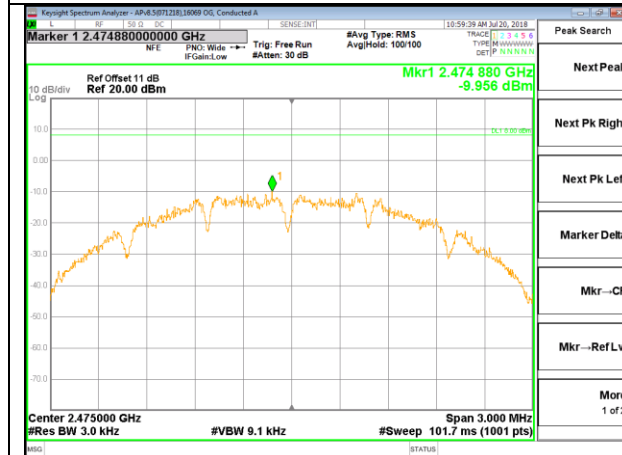
Channel	Frequency (MHz)	Chain 0 Meas (dBm/3kHz)	Total Corr'd PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low 11	2405	-9.727	-9.73	8.0	-17.7
Mid 18	2440	-9.515	-9.52	8.0	-17.5
High 25	2475	-9.956	-9.96	8.0	-18.0
High 26	2480	-9.825	-9.83	8.0	-17.8



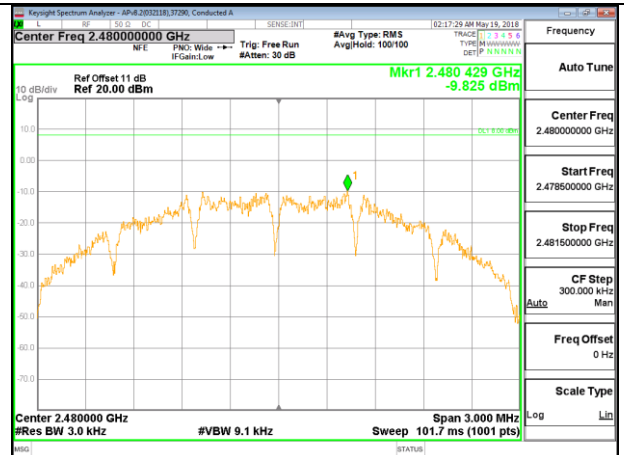
LOW CHANNEL 11



MID CHANNEL 18



HIGH CHANNEL 25



HIGH CHANNEL 26

8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

RSS-247 5.5

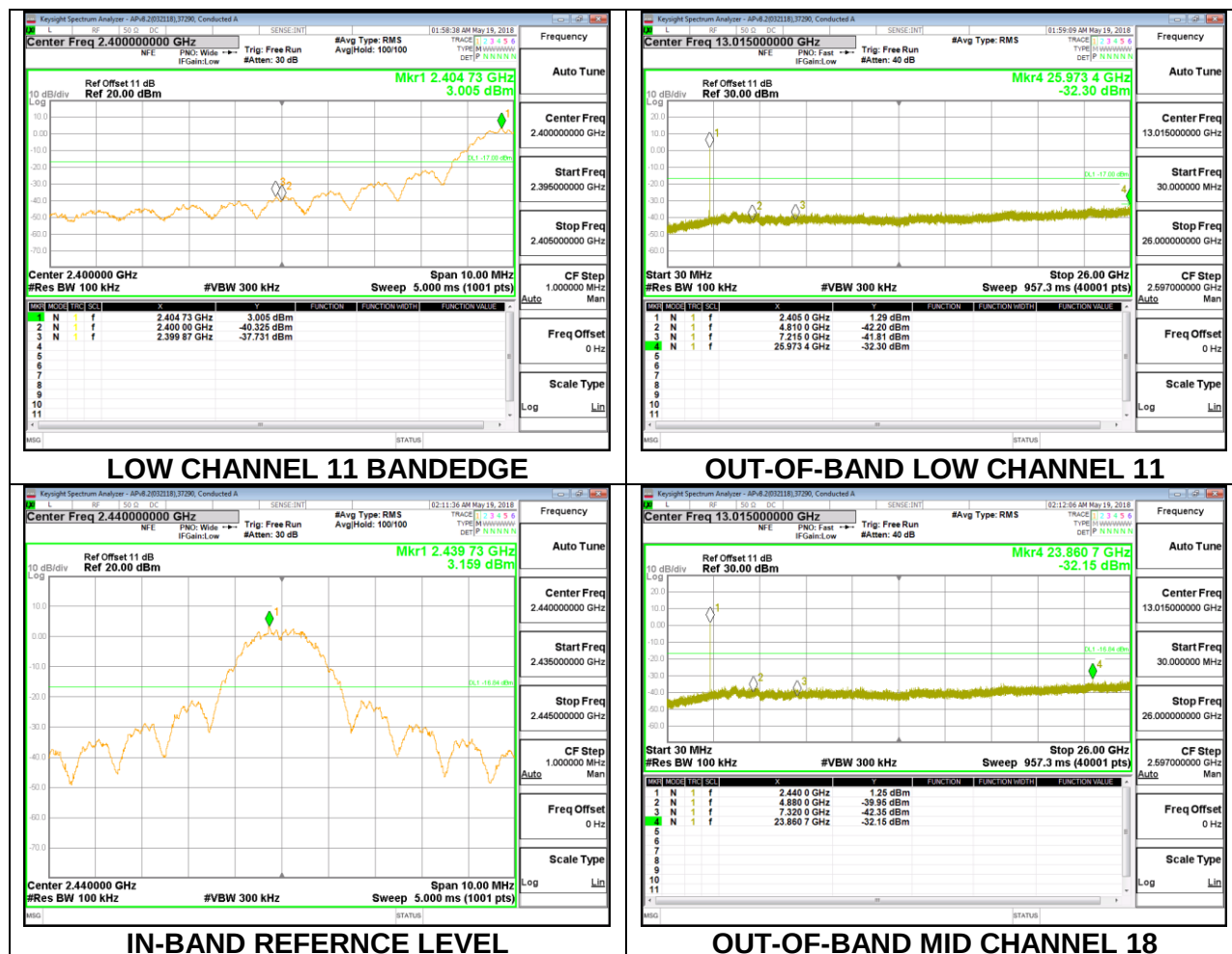
Output power was measured based on the use of peak measurement, therefore the required attenuation is 20 dB.

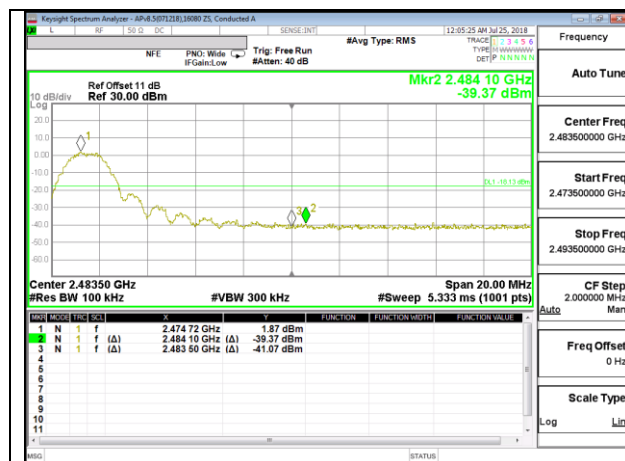
TEST PROCEDURE

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.

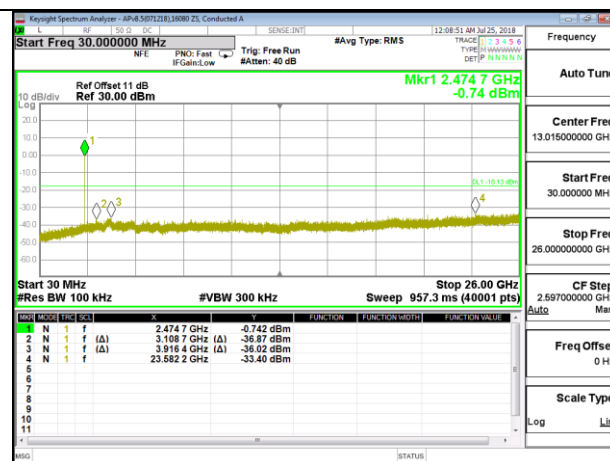
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

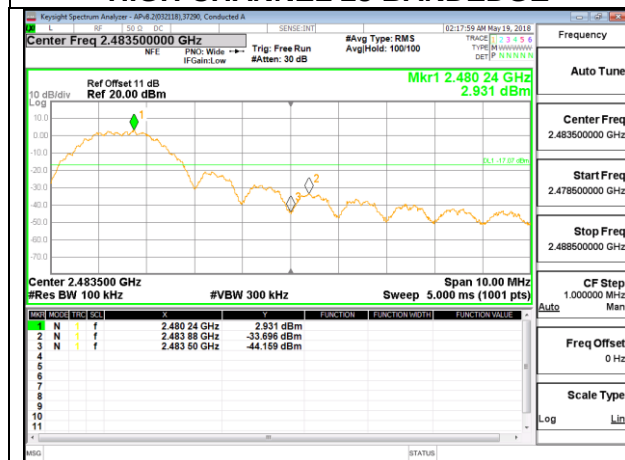




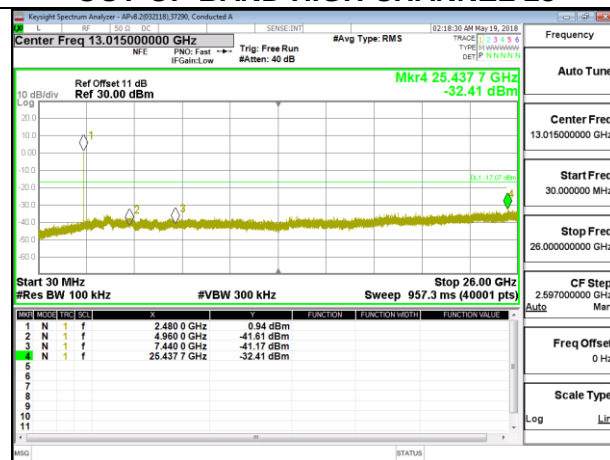
HIGH CHANNEL 25 BANDEDGE



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.

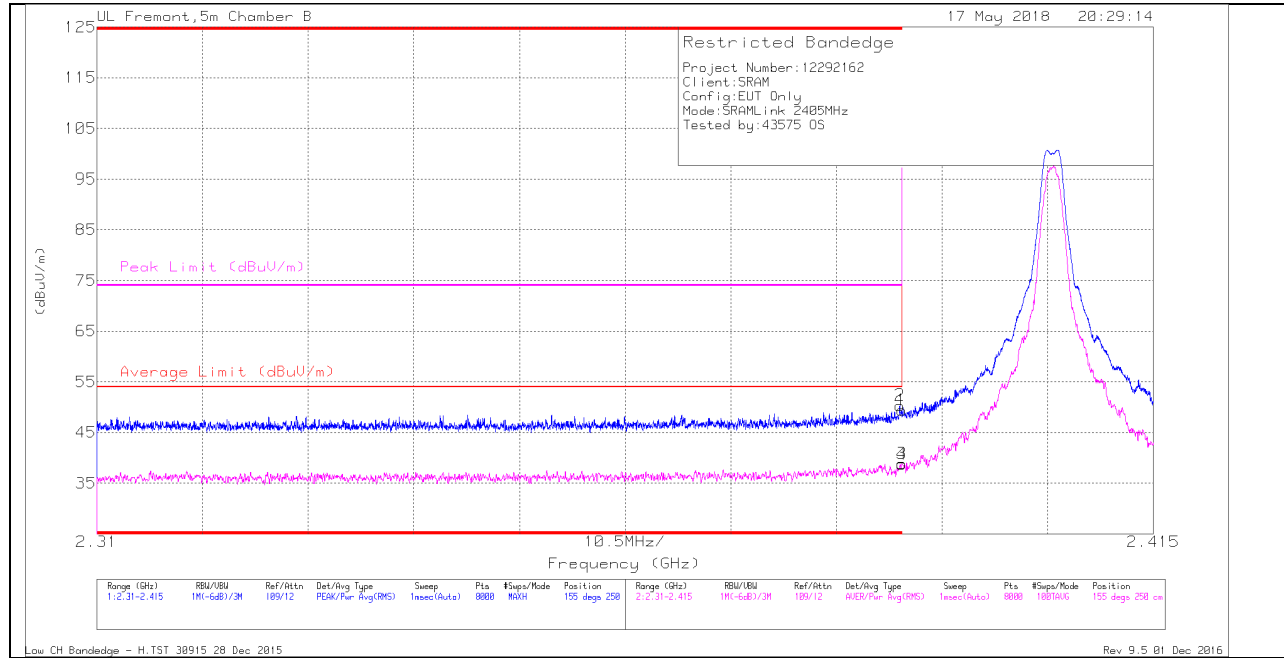
The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

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

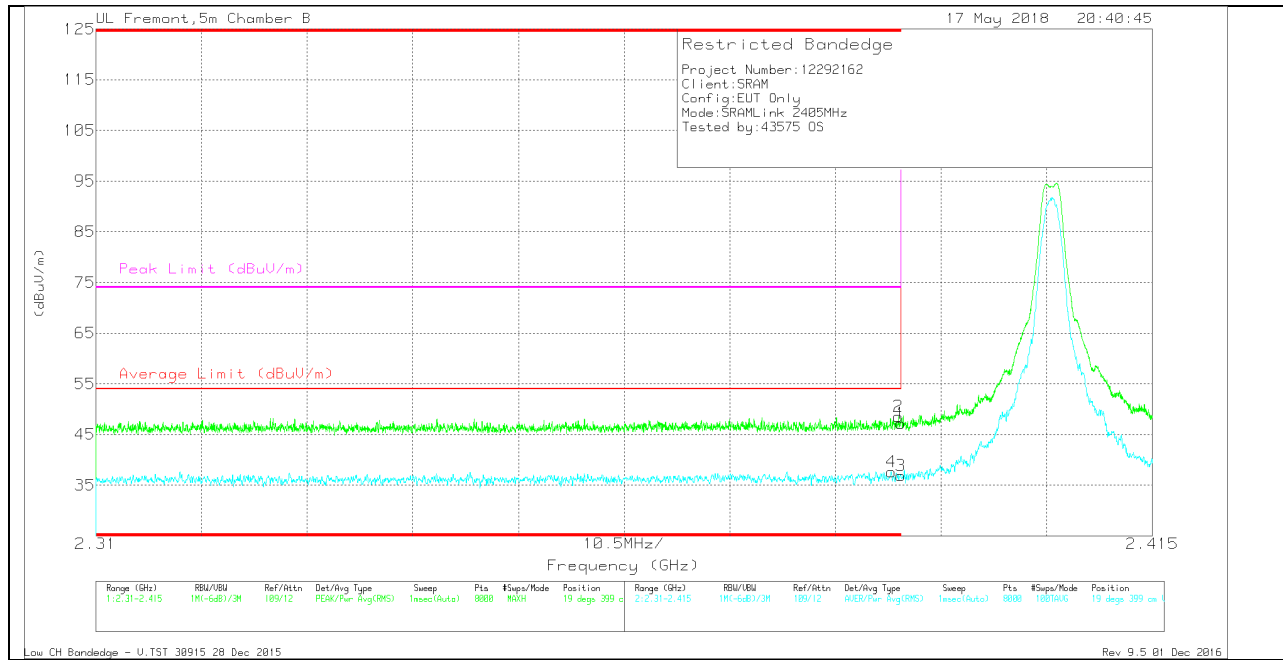
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.91	Pk	32	-21.5	0	49.41	-	-	74	-24.59	155	250	H
2	* 2.39	39.85	Pk	32	-21.5	0	50.35	-	-	74	-23.65	155	250	H
3	* 2.39	28.37	RMS	32	-21.5	0	38.87	54	-15.13	-	-	155	250	H
4	* 2.39	28.3	RMS	32	-21.5	0	38.8	54	-15.2	-	-	155	250	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/Fitr/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	* 2.39	36.73	Pk	32	-21.5	0	47.23	-	-	74	-26.77	19	399	V
2	* 2.39	38.02	Pk	32	-21.5	0	48.52	-	-	74	-25.48	19	399	V
3	* 2.39	26.42	RMS	32	-21.5	0	36.92	54	-17.08	-	-	19	399	V
4	* 2.389	27.18	RMS	32	-21.5	0	37.68	54	-16.32	-	-	19	399	V

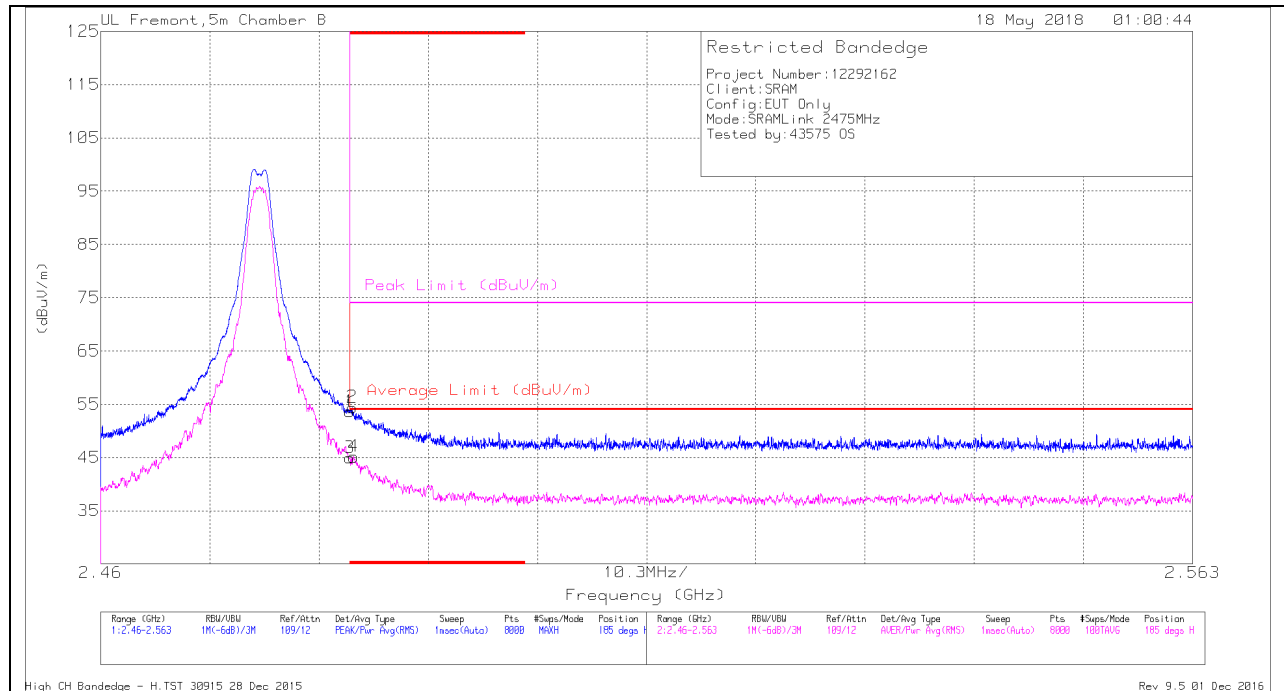
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL, CH 25)

HORIZONTAL RESULT



Trace Markers

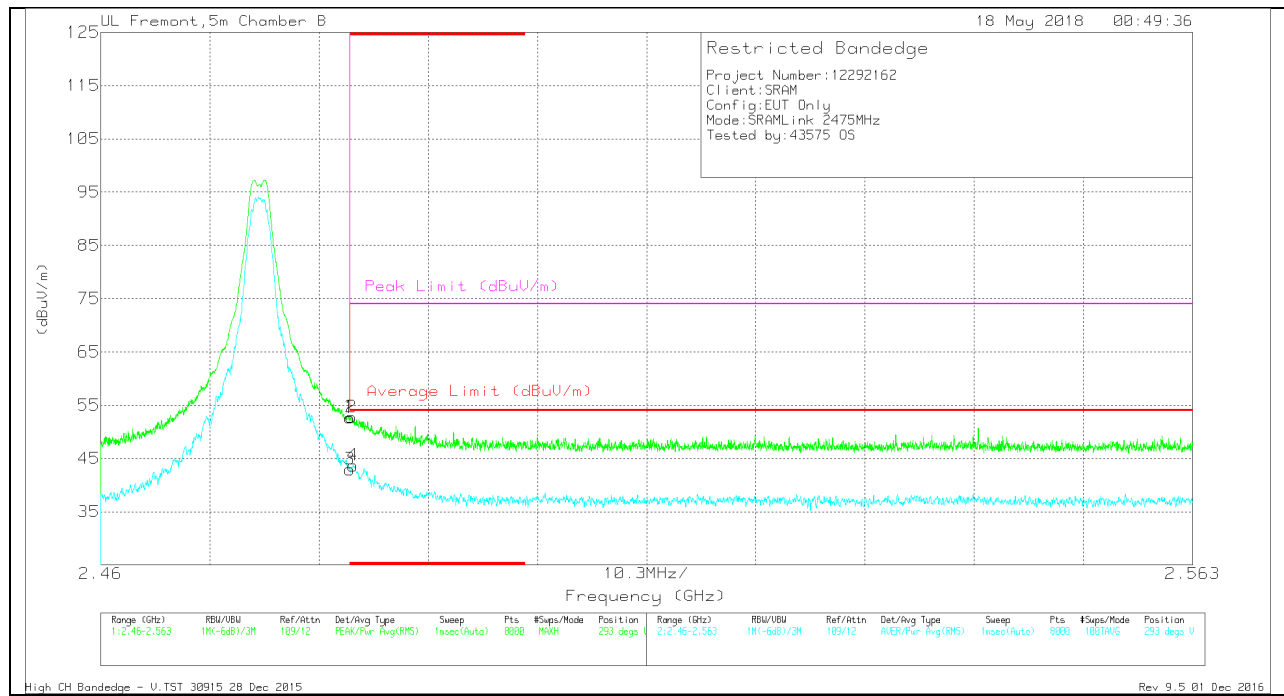
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Fitr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	42.6	Pk	32.5	-21.5	0	53.6	-	-	74	-20.4	185	267	H
2	* 2.484	43.41	Pk	32.5	-21.5	0	54.41	-	-	74	-19.59	185	267	H
3	* 2.484	33.94	RMS	32.5	-21.5	0	44.94	54	-9.06	-	-	185	267	H
4	* 2.484	34.15	RMS	32.5	-21.5	0	45.15	54	-8.85	-	-	185	267	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/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	* 2.484	41.69	Pk	32.5	-21.5	0	52.69	-	-	74	-21.31	293	387	V
2	* 2.484	41.75	Pk	32.5	-21.5	0	52.75	-	-	74	-21.25	293	387	V
3	* 2.484	31.95	RMS	32.5	-21.5	0	42.95	54	-11.05	-	-	293	387	V
4	* 2.484	32.68	RMS	32.5	-21.5	0	43.68	54	-10.32	-	-	293	387	V

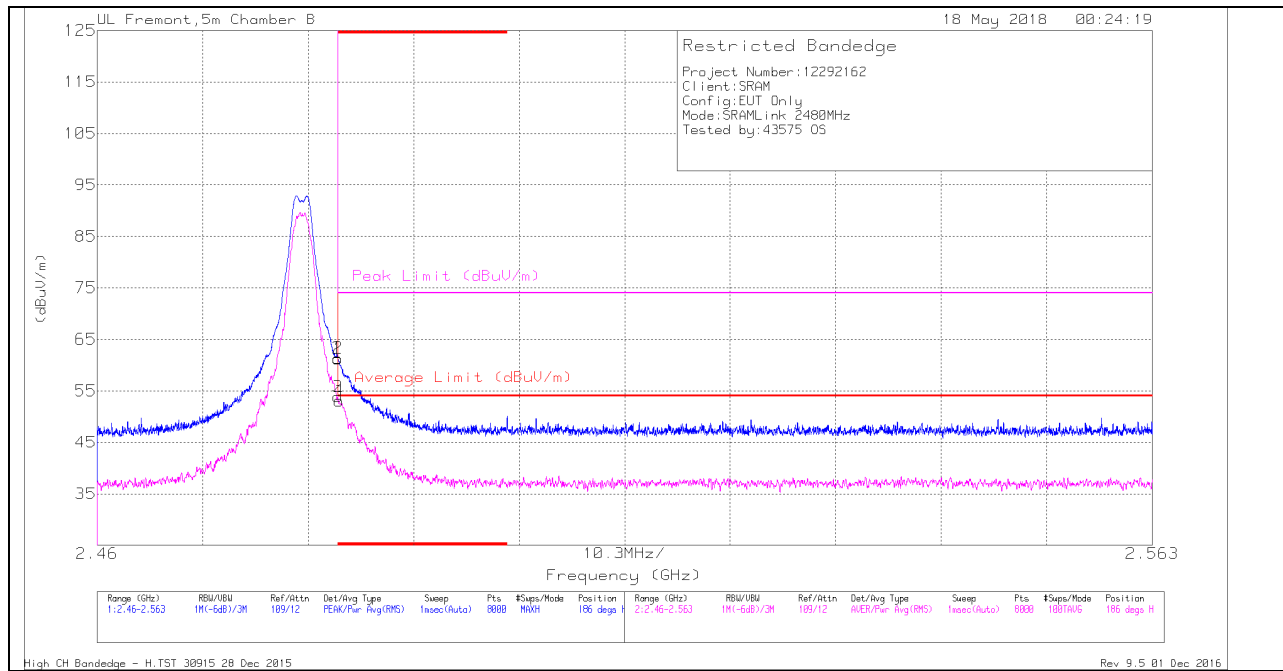
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL, CH 26)

HORIZONTAL RESULT



Trace Markers

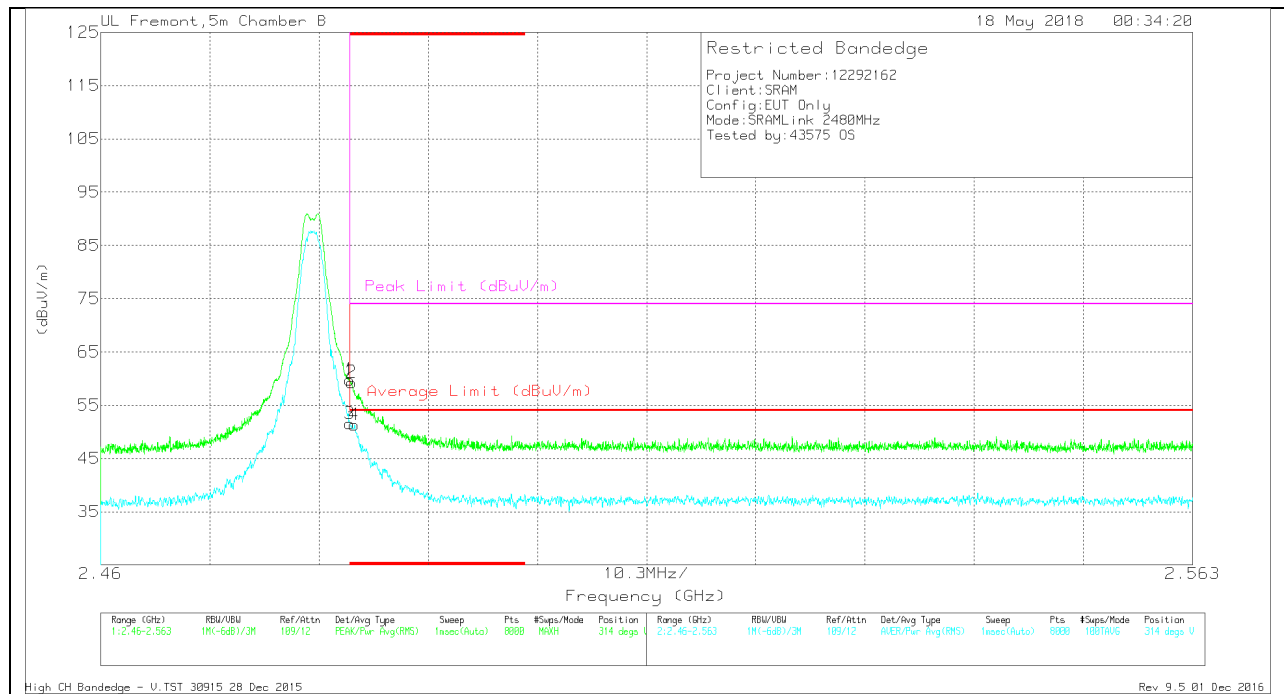
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	50.25	Pk	32.5	-21.5	0	61.25	-	-	74	-12.75	186	340	H
2	* 2.484	50.36	Pk	32.5	-21.5	0	61.36	-	-	74	-12.64	186	340	H
3	* 2.484	42.87	RMS	32.5	-21.5	0	53.87	54	-13	-	-	186	340	H
4	* 2.484	42.08	RMS	32.5	-21.5	0	53.08	54	-92	-	-	186	340	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/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	* 2.484	48.75	Pk	32.5	-21.5	0	59.75	-	-	74	-14.25	314	386	V
2	* 2.484	48.26	Pk	32.5	-21.5	0	59.26	-	-	74	-14.74	314	386	V
3	* 2.484	40.52	RMS	32.5	-21.5	0	51.52	54	-2.48	-	-	314	386	V
4	* 2.484	40.28	RMS	32.5	-21.5	0	51.28	54	-2.72	-	-	314	386	V

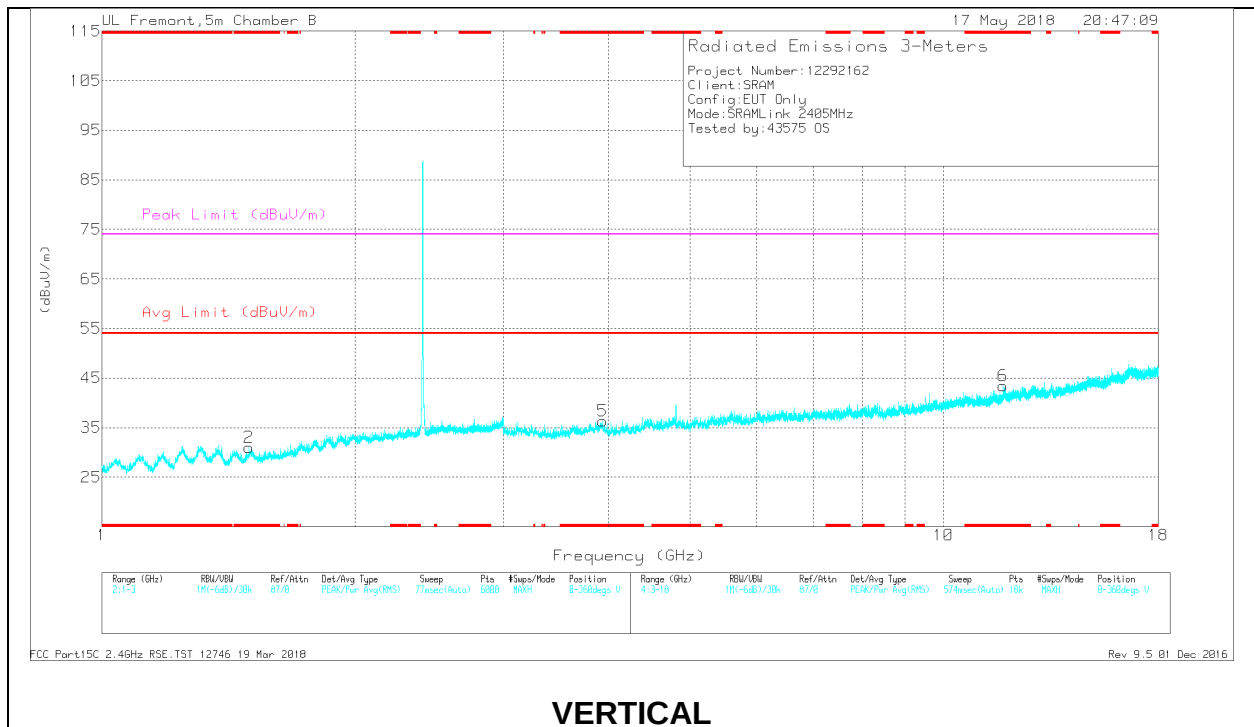
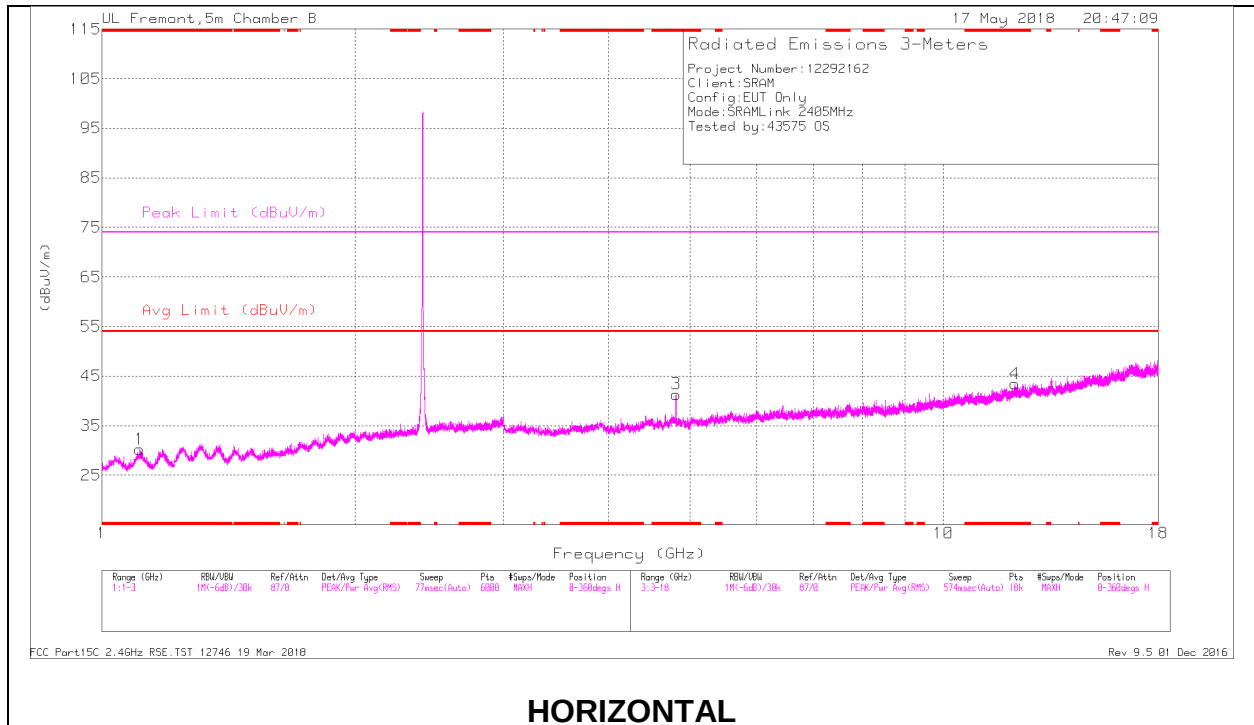
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL, CH 11 RESULTS



RADIATED EMISSIONS

Radiated Emissions

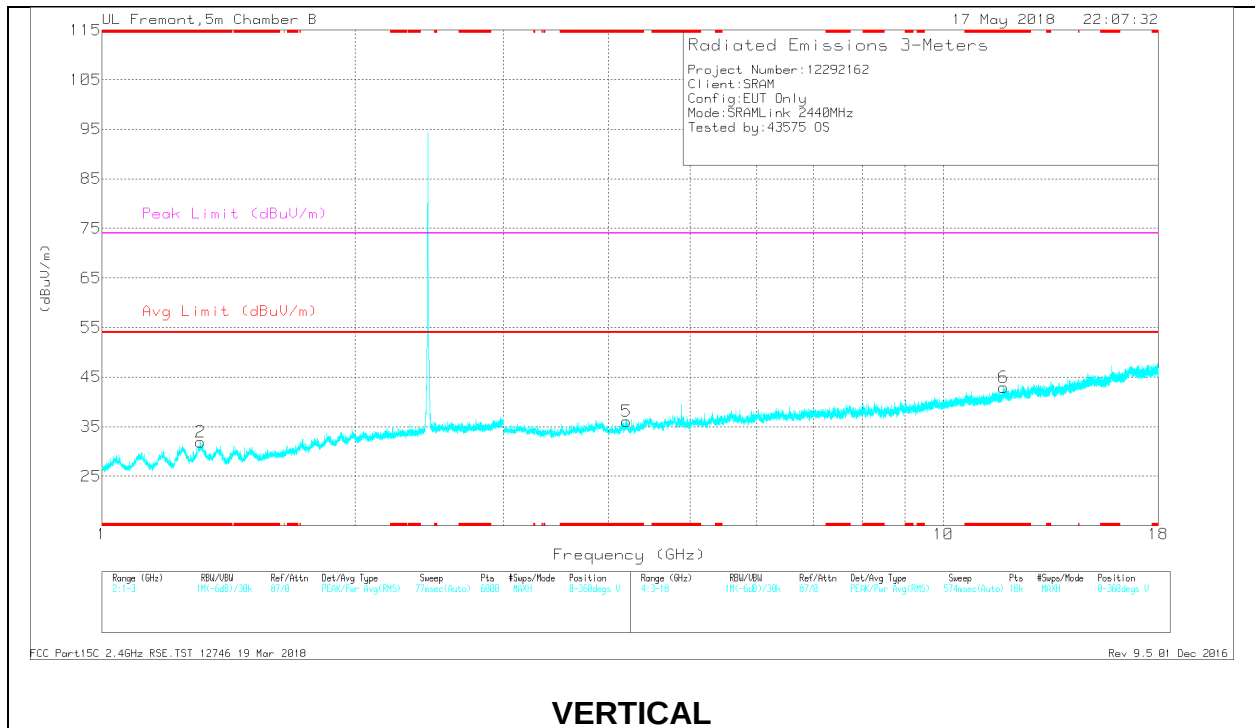
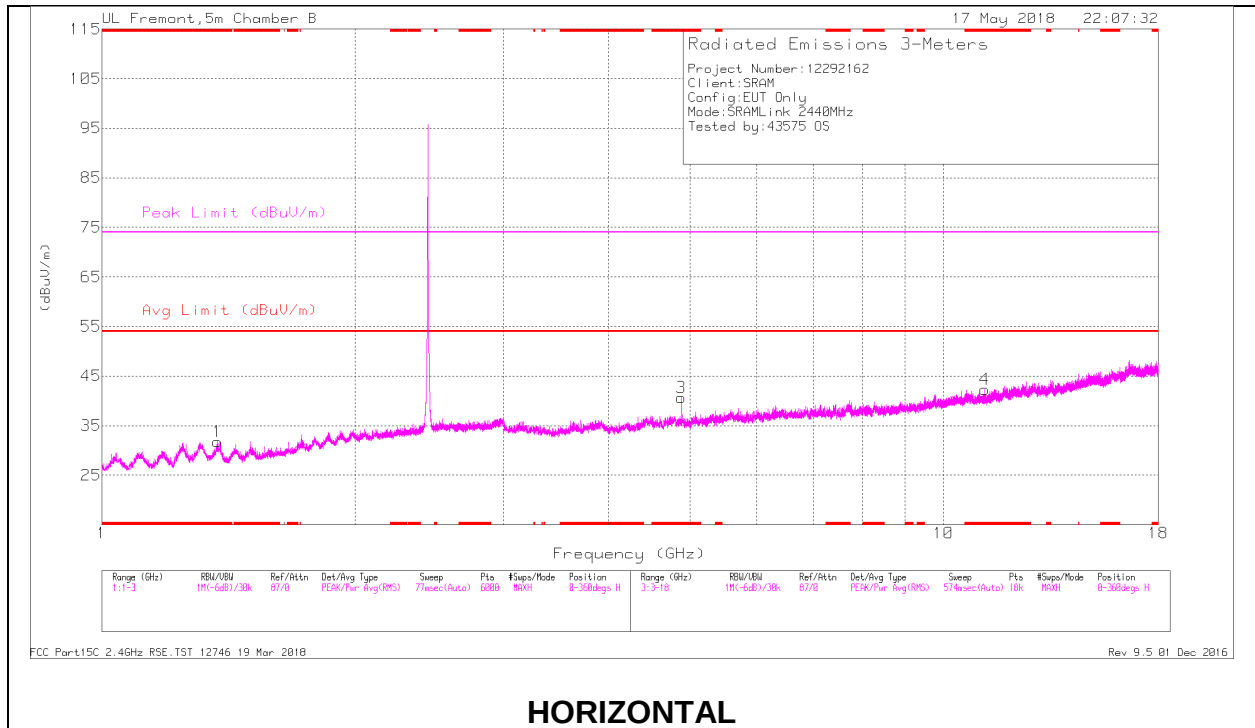
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.108	31.35	PK2	27.6	-23.2	0	35.75	-	-	74	-38.25	325	128	H
	* 1.11	19.54	MAv1	27.6	-23.2	0	23.94	54	-30.06	-	-	325	128	H
2	* 1.495	30.09	PK2	28.2	-21.6	0	36.69	-	-	74	-37.31	271	172	V
	* 1.498	18.07	MAv1	28.2	-21.4	0	24.87	54	-29.13	-	-	271	172	V
3	* 4.809	43.48	PK2	34.4	-30.4	0	47.48	-	-	74	-26.52	234	138	H
	* 4.811	34.64	MAv1	34.4	-30.4	0	38.64	54	-15.36	-	-	234	138	H
4	* 12.151	34.15	PK2	39	-23.8	0	49.35	-	-	74	-24.65	197	372	H
	* 12.151	21.86	MAv1	39	-23.7	0	37.16	54	-16.84	-	-	197	372	H
5	* 3.933	39.57	PK2	33.5	-30.7	0	42.37	-	-	74	-31.63	111	291	V
	* 3.933	27.89	MAv1	33.5	-30.7	0	30.69	54	-23.31	-	-	111	291	V
6	* 11.771	32.96	PK2	38.5	-23.6	0	47.86	-	-	74	-26.14	354	135	V
	* 11.769	21.71	MAv1	38.5	-23.5	0	36.71	54	-17.29	-	-	354	135	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



RADIATED EMISSIONS

Radiated Emissions

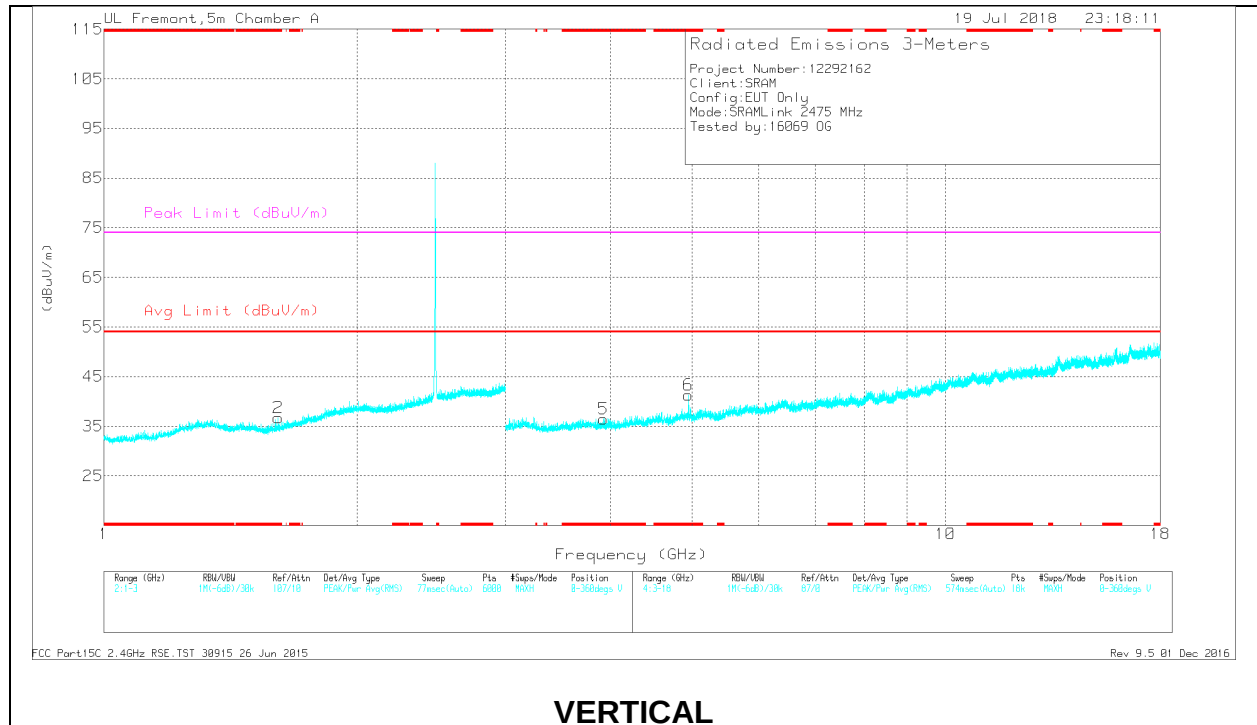
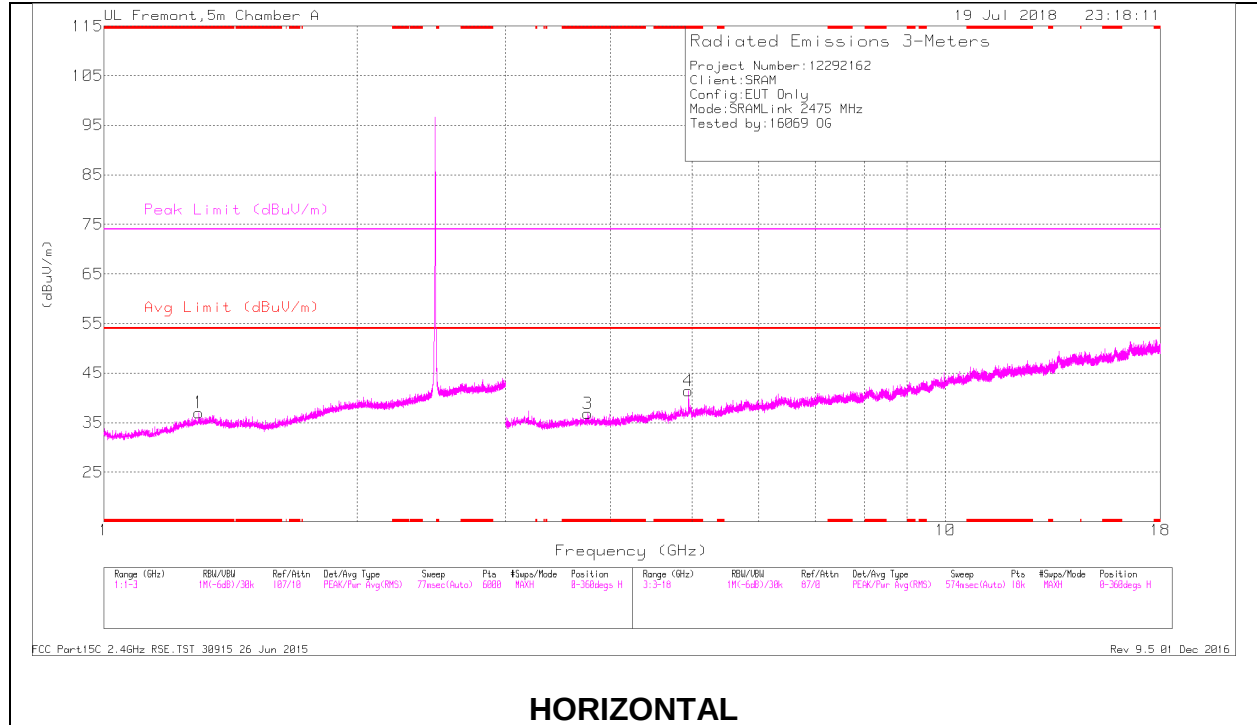
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.373	31.04	PK2	28.6	-22	0	37.64	-	-	74	-36.36	327	232	H
	* 1.373	18.73	MAv1	28.6	-22	0	25.33	54	-28.67	-	-	327	232	H
2	* 1.31	30.46	PK2	28.9	-22.2	0	37.16	-	-	74	-36.84	0	334	V
	* 1.311	19.01	MAv1	28.9	-22.2	0	25.71	54	-28.29	-	-	0	334	V
3	* 4.879	43.45	PK2	34.4	-31.4	0	46.45	-	-	74	-27.55	130	119	H
	* 4.879	34.6	MAv1	34.4	-31.4	0	37.6	54	-16.4	-	-	130	119	H
4	* 11.2	33.57	PK2	37.8	-24.5	0	46.87	-	-	74	-27.13	165	105	H
	* 11.197	22.11	MAv1	37.8	-24.5	0	35.41	54	-18.59	-	-	165	105	H
5	* 4.2	38.99	PK2	33.4	-30.2	0	42.19	-	-	74	-31.81	219	204	V
	* 4.201	27.32	MAv1	33.4	-30.2	0	30.52	54	-23.48	-	-	219	204	V
6	* 11.797	33.31	PK2	38.6	-23.6	0	48.31	-	-	74	-25.69	326	181	V
	* 11.794	21.78	MAv1	38.6	-23.6	0	36.78	54	-17.22	-	-	326	181	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



RADIATED EMISSIONS

Radiated Emissions

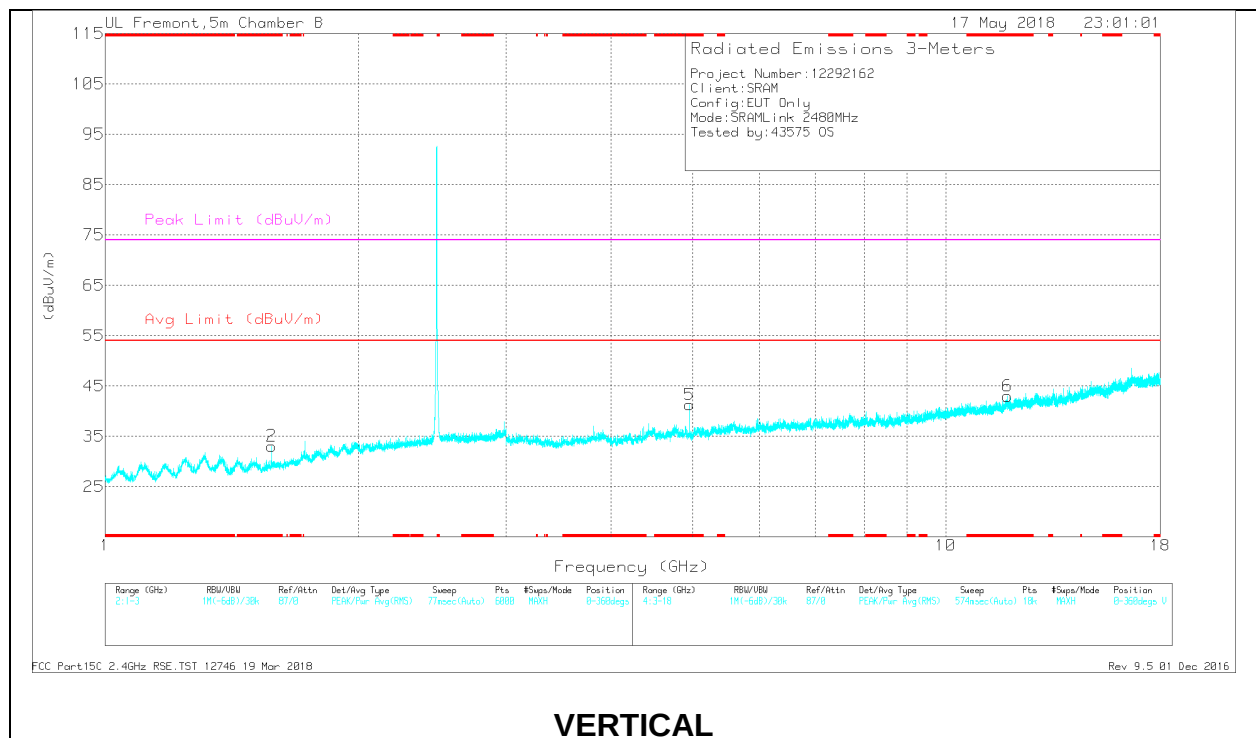
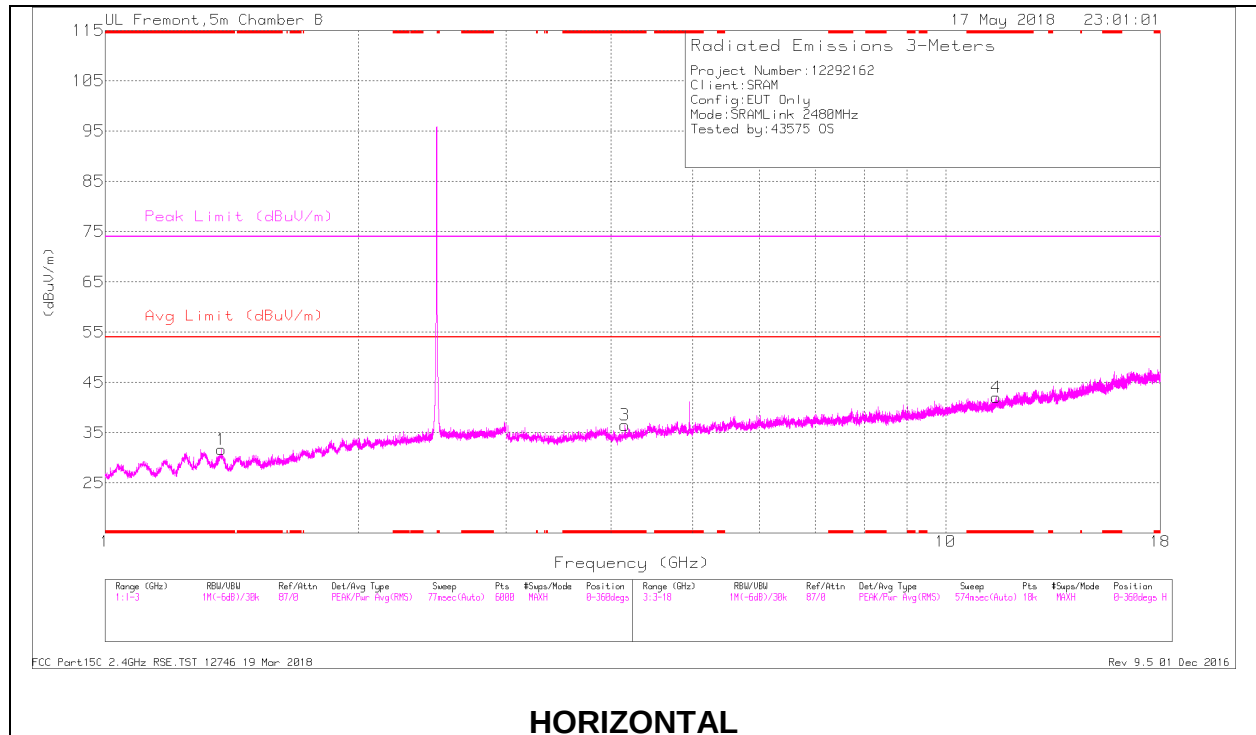
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Fitr/ Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 1.298	36.8	PK2	29.4	-23.3	0	42.9	-	-	74	-31.1	341	293	H
* 1.297	24.05	MAv1	29.4	-23.3	0	30.15	54	-23.85	-	-	341	293	H
* 1.609	35.95	PK2	28.2	-23.1	0	41.05	-	-	74	-32.95	344	270	V
* 1.612	24.31	MAv1	28.3	-23.1	0	29.51	54	-24.49	-	-	344	270	V
* 3.758	37.04	PK2	33.2	-28	0	42.24	-	-	74	-31.76	0	134	H
* 3.761	25.56	MAv1	33.2	-28	0	30.76	54	-23.24	-	-	0	134	H
* 4.951	39.46	PK2	34.2	-26.5	0	47.16	-	-	74	-26.84	214	127	H
* 4.951	29.49	MAv1	34.2	-26.5	0	37.19	54	-16.81	-	-	214	127	H
* 3.92	37.27	PK2	33.2	-27.8	0	42.67	-	-	74	-31.33	59	102	V
* 3.923	25.67	MAv1	33.2	-27.9	0	30.97	54	-23.03	-	-	59	102	V
* 4.949	39.86	PK2	34.2	-26.5	0	47.56	-	-	74	-26.44	296	353	V
* 4.949	29.83	MAv1	34.2	-26.5	0	37.53	54	-16.47	-	-	296	353	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



RADIATED EMISSIONS

Radiated Emissions

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/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	* 1.375	30.64	PK2	28.5	-22.1	0	37.04	-	-	74	-36.96	161	252	H
	* 1.376	18.88	MAv1	28.5	-22.1	0	25.28	54	-28.72	-	-	161	252	H
2	* 1.579	30.19	PK2	28.1	-21.5	0	36.79	-	-	74	-37.21	11	349	V
	* 1.576	17.77	MAv1	28	-21.5	0	24.27	54	-29.73	-	-	11	349	V
3	* 4.153	39.31	PK2	33.4	-30.8	0	41.91	-	-	74	-32.09	47	299	H
	* 4.156	27.72	MAv1	33.4	-30.8	0	30.32	54	-23.68	-	-	47	299	H
4	* 11.487	33.13	PK2	38.1	-23.7	0	47.53	-	-	74	-26.47	119	246	H
	* 11.489	21.93	MAv1	38.1	-23.6	0	36.43	54	-17.57	-	-	119	246	H
5	* 4.959	43.67	PK2	34.4	-30.9	0	47.17	-	-	74	-26.83	293	110	V
	* 4.959	35.39	MAv1	34.4	-30.9	0	38.89	54	-15.11	-	-	293	110	V
6	* 11.837	33.27	PK2	38.6	-23.3	0	48.57	-	-	74	-25.43	5	385	V
	* 11.839	21.63	MAv1	38.6	-23.4	0	36.83	54	-17.17	-	-	5	385	V

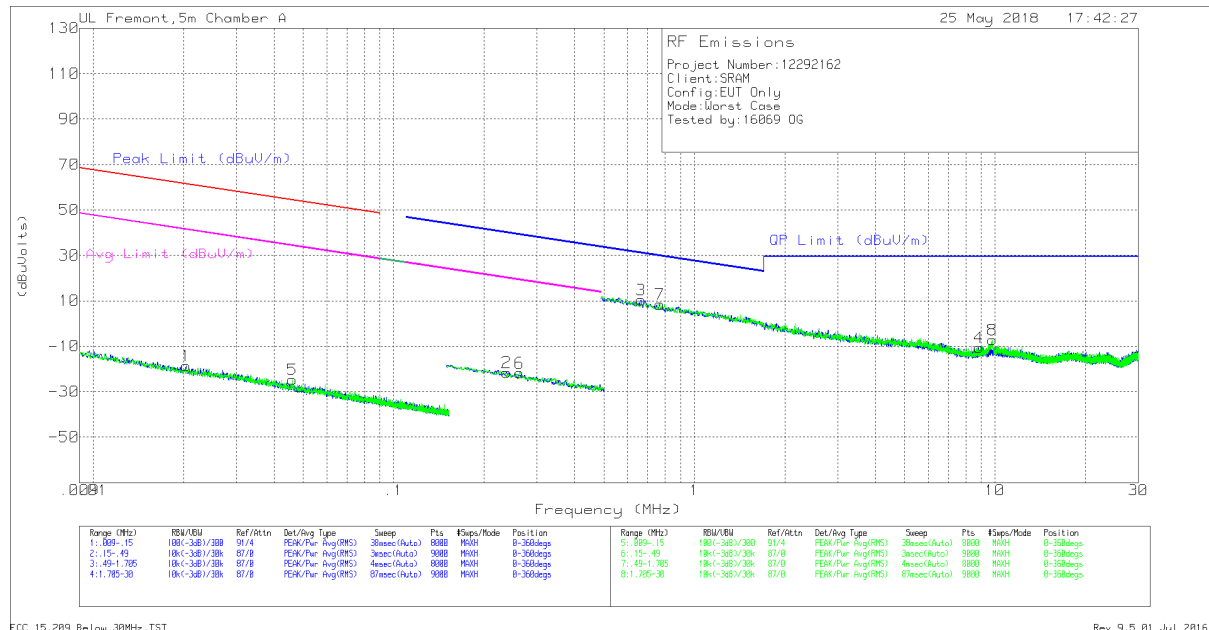
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

9.2. Worst Case Below 30MHz

FACE ON AND FACE OFF PLOTS



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

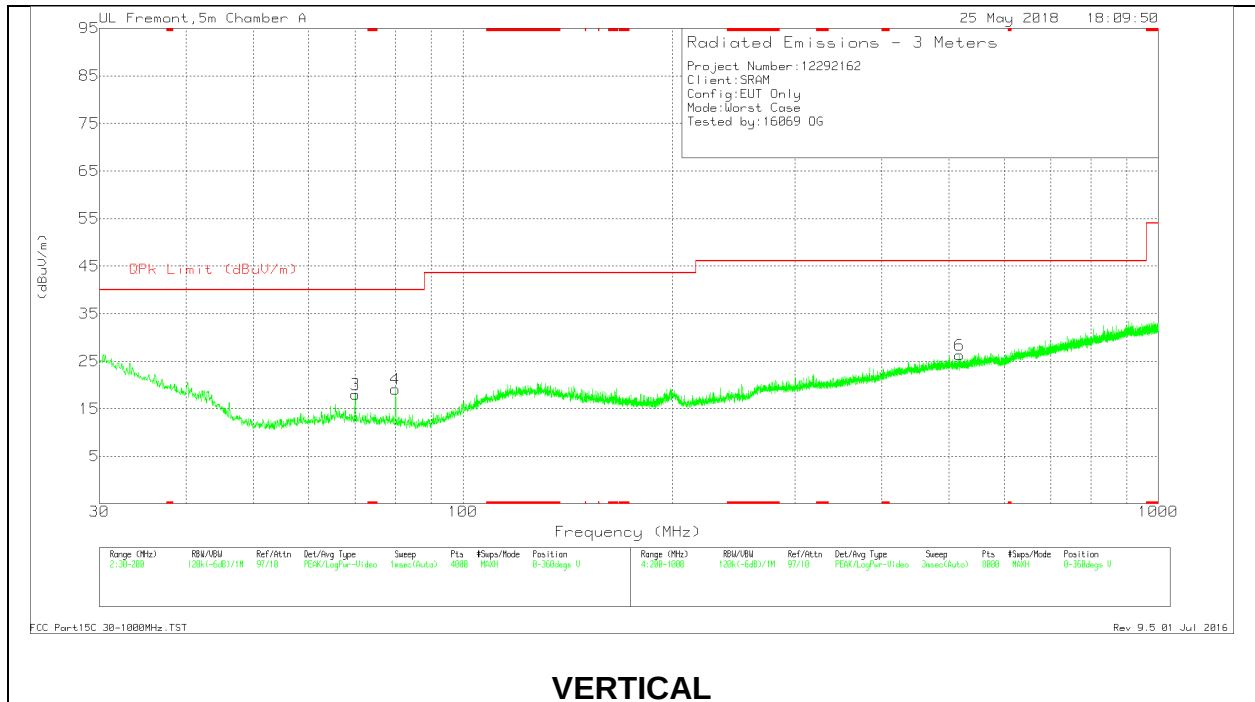
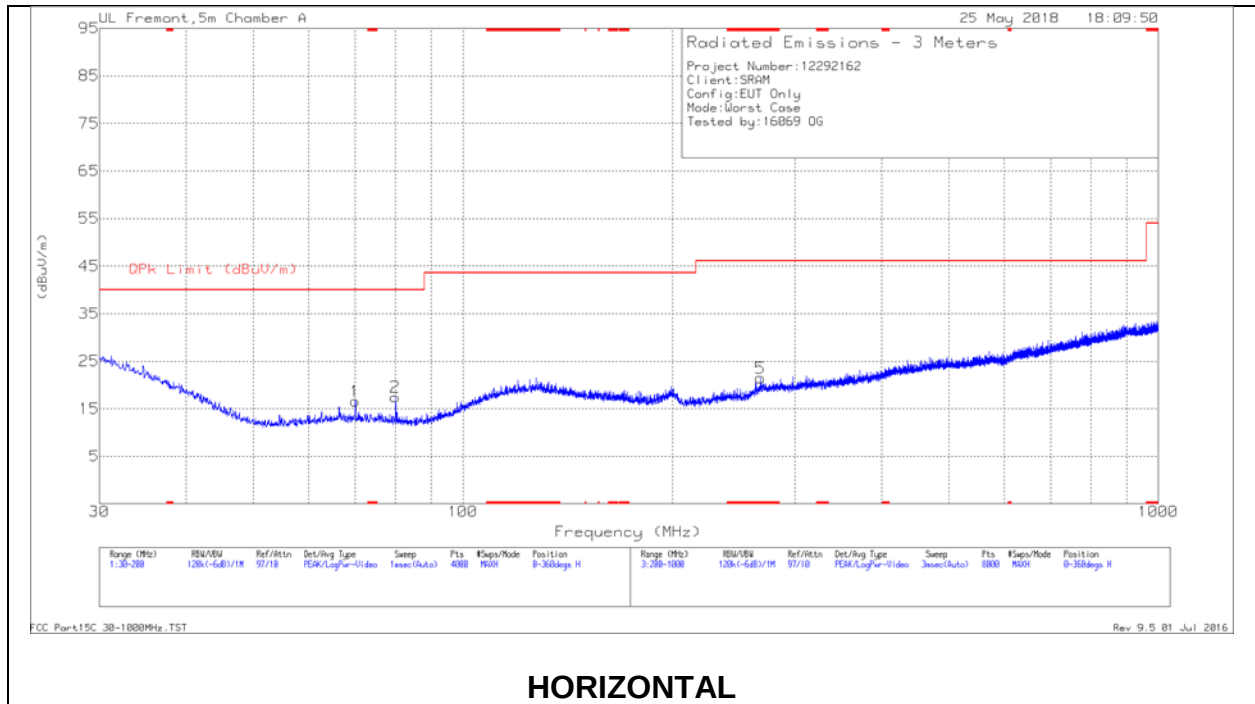
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.02039	46.64	Pk	14.7	.1	-80	-18.56	61.39	-79.95	41.39	-59.95	-	-	-	-	0-360
5	.04603	40.73	Pk	14.5	.1	-80	-24.67	54.32	-78.99	34.32	-58.99	-	-	-	-	0-360
2	.23762	44.47	Pk	13.9	.1	-80	-21.53	-	-	-	-	40.1	-61.63	20.1	-41.63	0-360
6	.26236	44.33	Pk	13.8	.1	-80	-21.77	-	-	-	-	39.24	-61.01	19.24	-41.01	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.66545	36.28	Pk	14	.1	-40	10.38	31.15	-20.77	-	-	-	-	0-360
7	.76801	34.43	Pk	14	.1	-40	8.53	29.91	-21.38	-	-	-	-	0-360
4	8.83821	14.54	Pk	14.4	.5	-40	-10.56	29.5	-40.06	-	-	-	-	0-360
8	9.79923	17.81	Pk	14.6	.4	-40	-7.19	29.5	-36.69	-	-	-	-	0-360

Pk - Peak detector

9.3. Worst Case Below 1 GHz



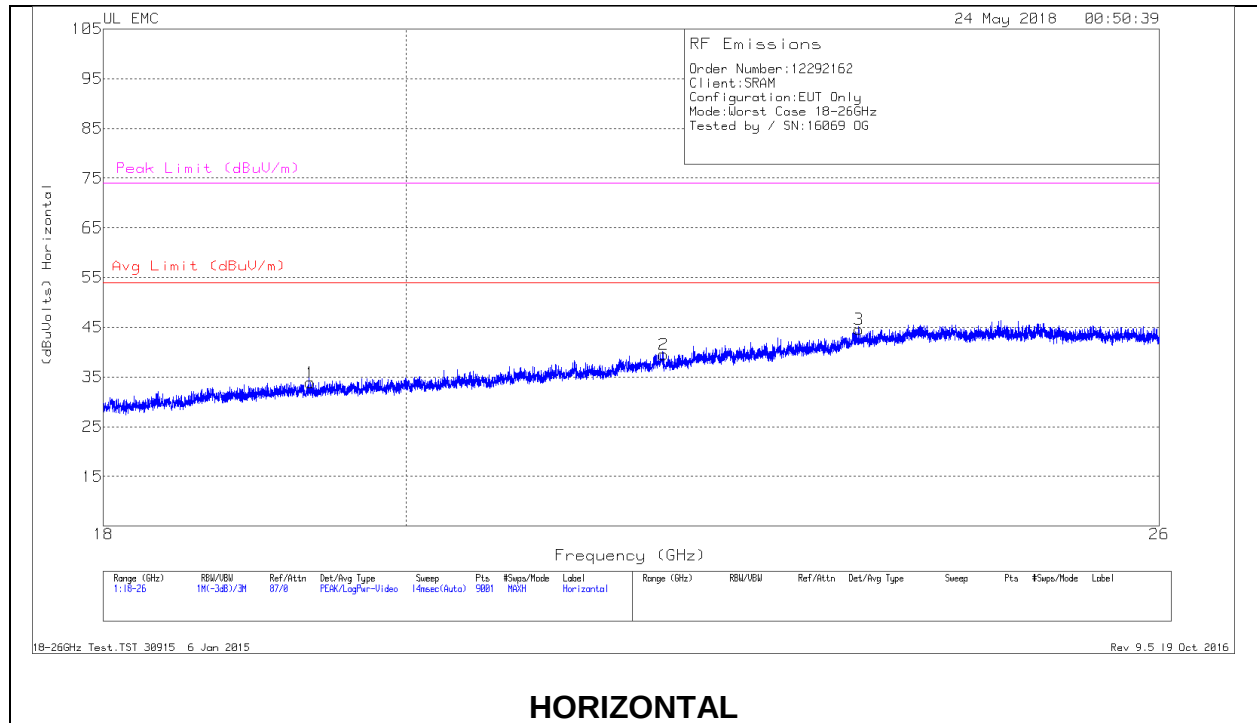
Below 1GHz DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	* 267.8	29.17	Pk	17	-24.7	21.47	46.02	-24.55	0-360	300	H
1	70.035	31.23	Pk	12.1	-26.7	16.63	40	-23.37	0-360	100	H
3	70.0775	32.6	Pk	12.1	-26.7	18	40	-22	0-360	100	V
2	79.98	32.56	Pk	11.5	-26.6	17.46	40	-22.54	0-360	300	H
4	79.98	34.24	Pk	11.5	-26.6	19.14	40	-20.86	0-360	100	V
6	517.9	29.79	Pk	21.7	-25.2	26.29	46.02	-19.73	0-360	300	V

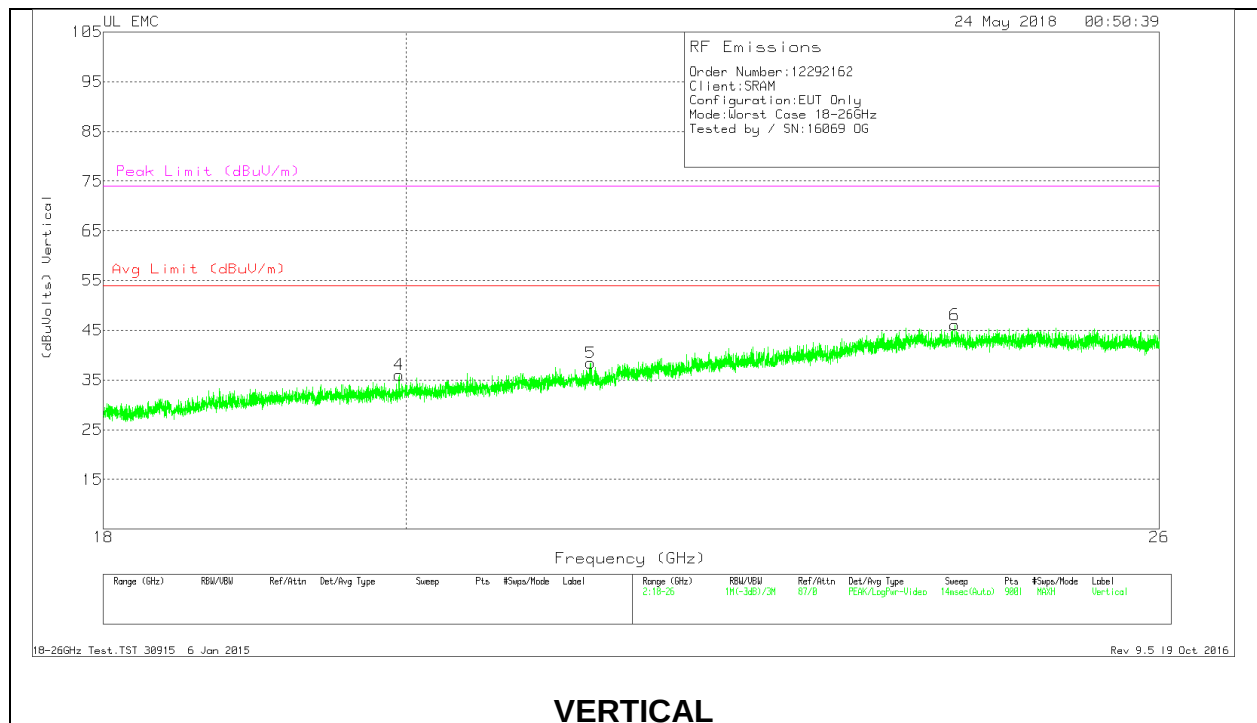
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

9.4. Worst Case 18-26 GHz



HORIZONTAL



VERTICAL

18 – 26GHz DATA

Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T449 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	19.345	35.49	Pk	32.6	-24.7	-9.5	33.89	54	-20.11	74	-40.11
2	21.876	40.71	Pk	33.3	-25	-9.5	39.51	54	-14.49	74	-34.49
3	23.418	44.56	Pk	33.9	-24.4	-9.5	44.56	54	-9.44	74	-29.44
4	19.952	37.72	Pk	32.8	-25	-9.5	36.02	54	-17.98	74	-37.98
5	21.327	40.14	Pk	33	-25.2	-9.5	38.44	54	-15.56	74	-35.56
6	24.212	45.78	Pk	33.9	-24.1	-9.5	46.08	54	-7.92	74	-27.92

Pk - Peak detector