



CERTIFICATION TEST REPORT

Report Number. : 12122303-E2V4

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

Model : 00220

FCC ID : C9O-SLMB1

IC : 10161A-SLMB1

EUT Description : Electronic Controller 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:

November 05, 2018

Prepared by:

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NVLAP LAB CODE 200065-0

REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	10/5/2018	Initial Issue	
V2	10/23/2018	Updated Sections 1, 2, and 6	Steven Tran
V3	10/29/2018	Updated Sections 8, 9 with channel 25 data	Steven Tran
V4	11/5/2018	Added channel 26 data	Glenn Escano

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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: Electronic Controller with AIREA and BLE radios

MODEL: 00220

SERIAL NUMBER: 3540100080 (Conducted); 1524030104 (Radiated)

DATE TESTED: January 16th 2018 – February 6th 2018, October 29th 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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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 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 checked="" type="checkbox"/> Chamber E (IC:22541-2)	<input type="checkbox"/> Chamber J (IC: 2324A-6)
<input type="checkbox"/> Chamber C (IC:2324B-3)	<input 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 an electronic controller with AIREA and BLE 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	AIREA	2.22	1.67	1.84	1.53

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a chip antenna, with a maximum gain of 1.3 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

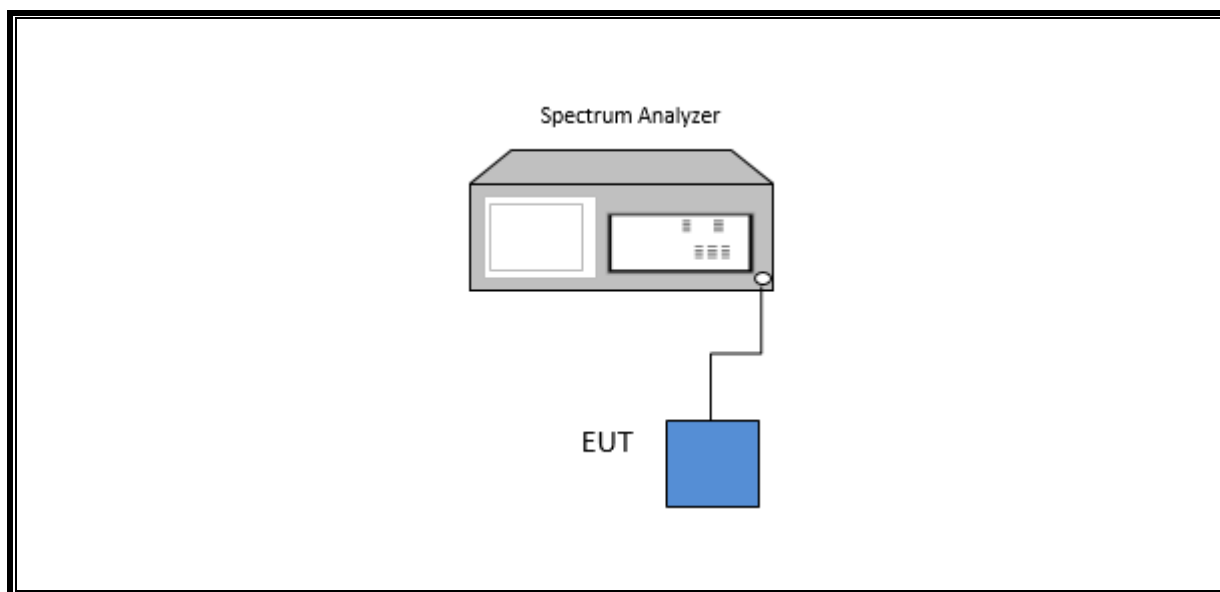
SUPPORT EQUIPMENT

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

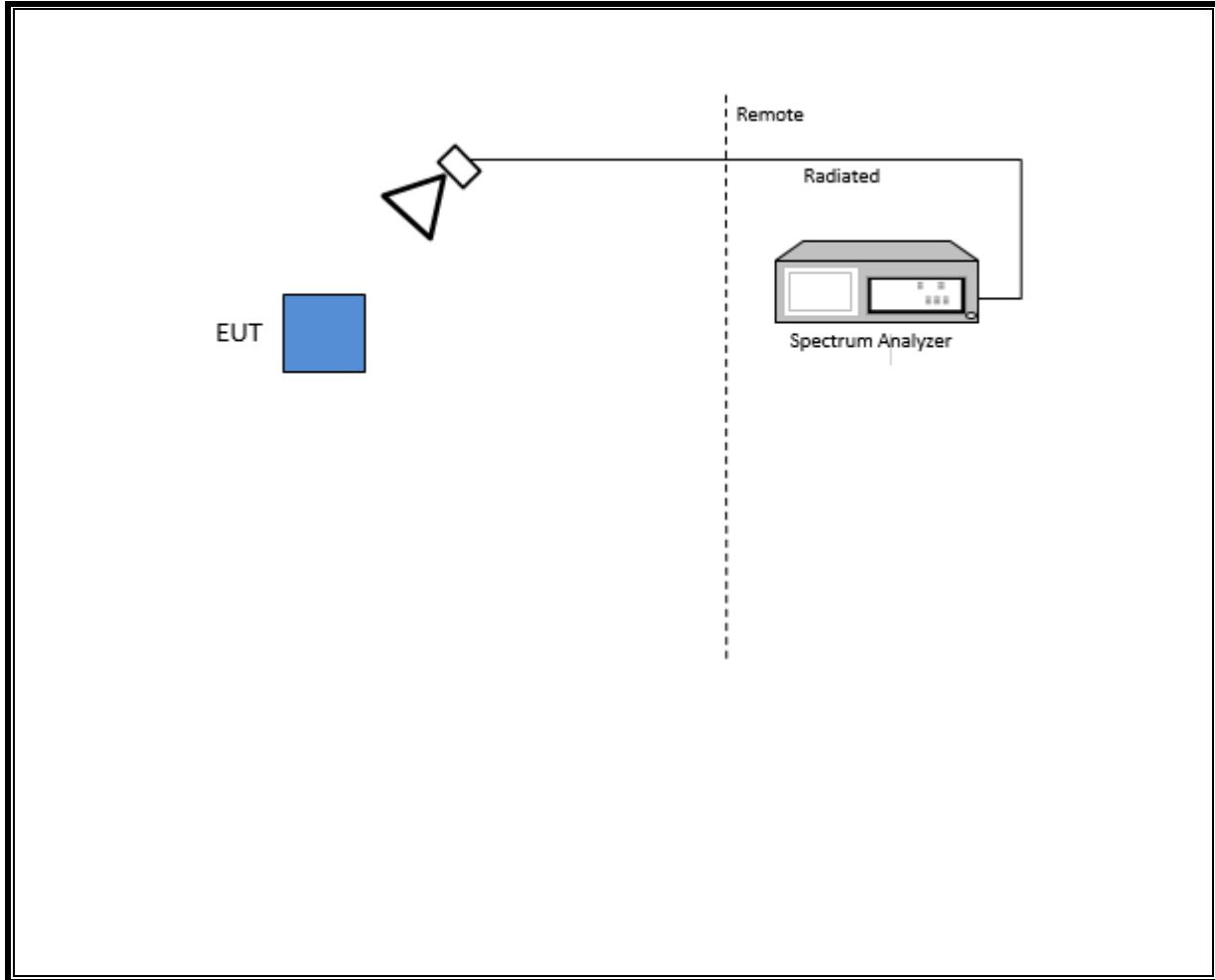
TEST SETUP

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

SETUP DIAGRAM FOR CONDUCTED TESTS



SETUP DIAGRAM FOR RADIATED TESTS



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 report:

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	T1466	04/11/17	04/11/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T862	06/09/17	06/09/18
RF Preamplifier, 1-8GHz	Miteq	AMF-4D-01000800-30-29P	T1573	11/25/17	11/25/18
Spectrum Analyzer	Agilent	N9030A	T907	02/07/18	02/07/19
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T863	06/09/17	06/09/18
RF Preamplifier, 1-8GHz	Miteq	AMF-4D-01000800-30-29P	T1156	12/16/17	12/16/18
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB3	T899	06/15/17	06/15/18
RF Preamplifier, 10kHz - 1GHz	HP	8447D	T10	02/15/17	02/15/18
Spectrum Analyzer	Agilent	N9030A	T906	02/16/18	02/16/19
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T346	03/28/17	03/28/18
RF Preamplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T1131	06/29/17	06/29/18
RF Preamplifier, 1-8GHz	Miteq	AMF-4D-01000800-30-29P	T1169	06/29/17	06/29/18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	T426	06/29/17	06/29/18
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
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T862	5/24/2018	5/24/2019

Test Software List			
Description	Manufacturer	Model	Version
Radiated Software	UL	UL EMC	Ver 9.5, June 24, 2015
Conducted Software	UL	UL EMC	Ver 9.5, May 26, 2015
Antenna Port Software	UL	UL RF	Ver 3.9.1, Dec 28, 2015

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

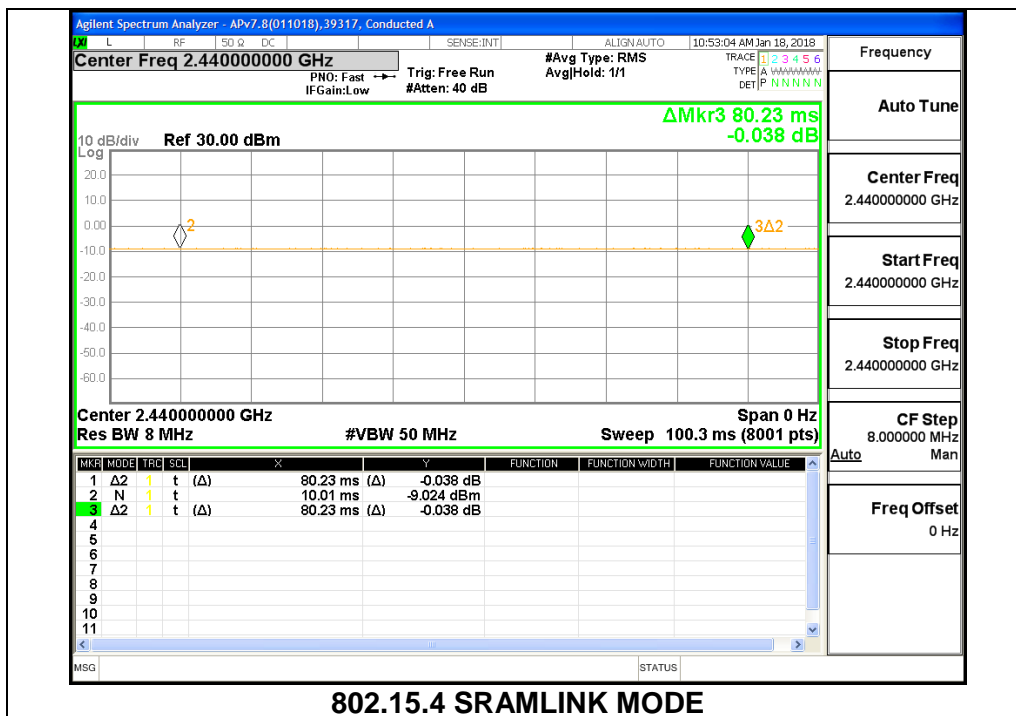
None; for reporting purposes only.

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 AIREA	80.2	80.2	1.000	100.00%	0.00	0.010



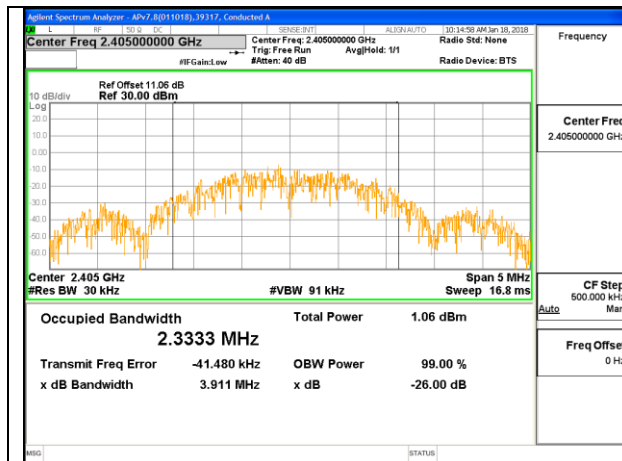
8.2. 99% BANDWIDTH

LIMITS

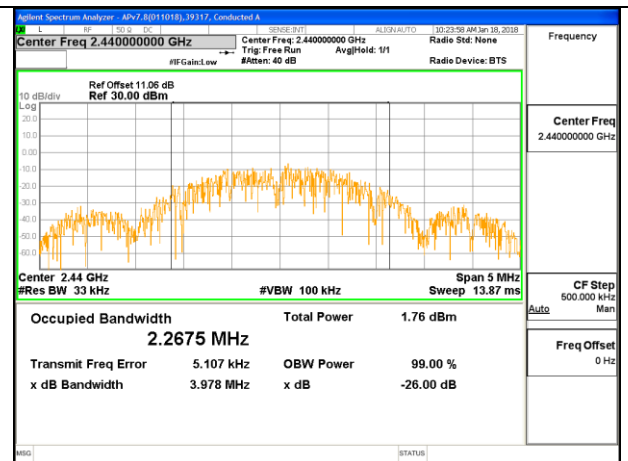
None; for reporting purposes only.

RESULTS

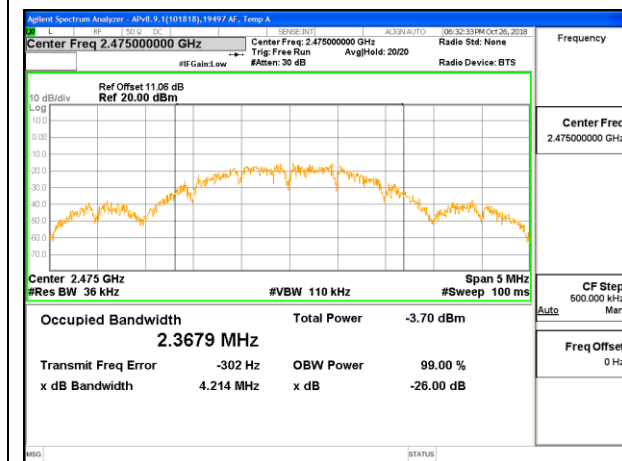
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low 11	2405	2.3333
Mid 18	2440	2.2675
High 25	2475	2.3679
High 26	2480	2.3165



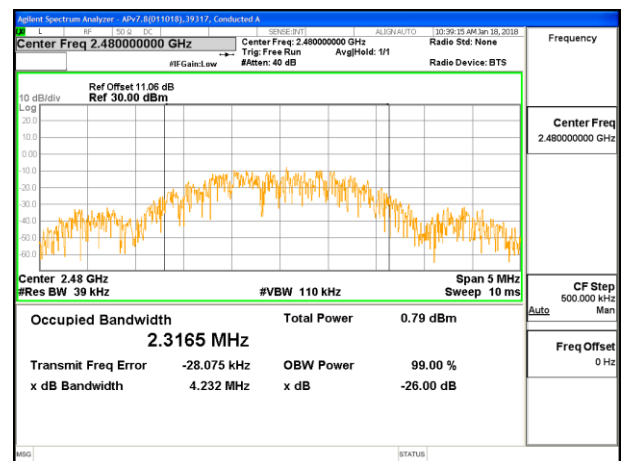
LOW CHANNEL 11



MID CHANNEL 18



HIGH CHANNEL 25



HIGH CHANNEL 26

8.3. 6 dB BANDWIDTH

LIMITS

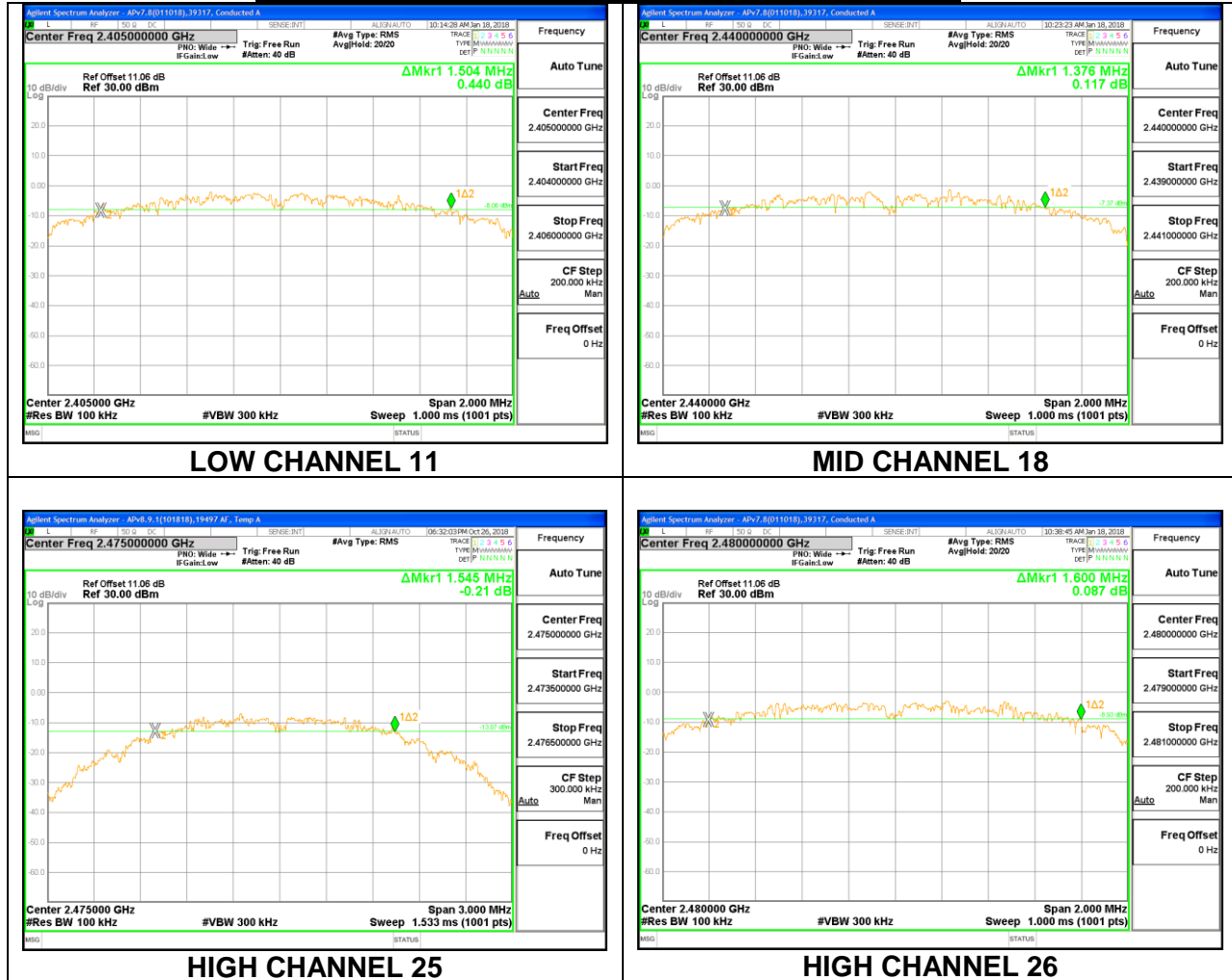
FCC §15.247 (a)(2)

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	1.504	0.5
Mid 18	2440	1.376	0.5
High 25	2475	1.545	0.5
High 26	2480	1.600	0.5



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 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

Tested By:	39317
Date:	02/06/18

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	-5.90	30.00	30	36	30.00
Mid 18	2440	-5.90	30.00	30	36	30.00
High 25	2475	-5.90	30.00	30	36	30.00
High 26	2480	-5.90	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	2.22	2.22	30.00	-27.78
Mid 18	2440	1.69	1.69	30.00	-28.31
High 25	2475	1.48	1.48	30.00	-28.52
High 26	2480	-3.92	-3.92	30.00	-33.92

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:	39317
Date:	02/06/18

Channel	Frequency (MHz)	Meas Power (dBm)
Low 11	2405	1.84
Mid 18	2440	1.27
High 25	2475	1.06
High 26	2480	-5.01

8.6. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

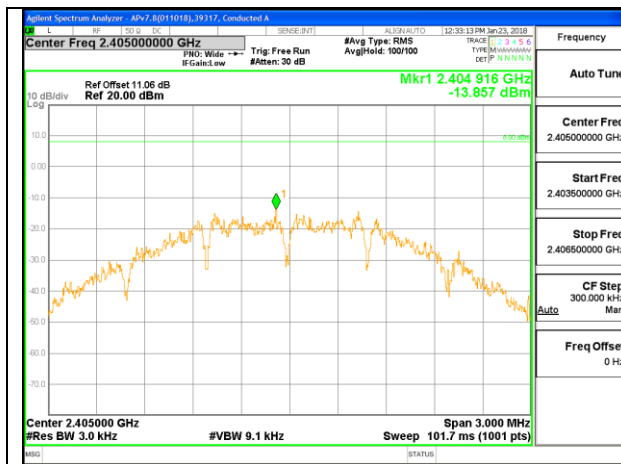
RSS-247 (5.2) (b)

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.

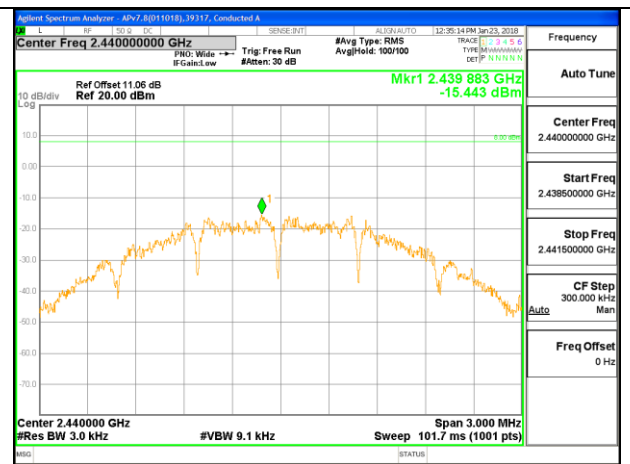
RESULTS

PSD Results

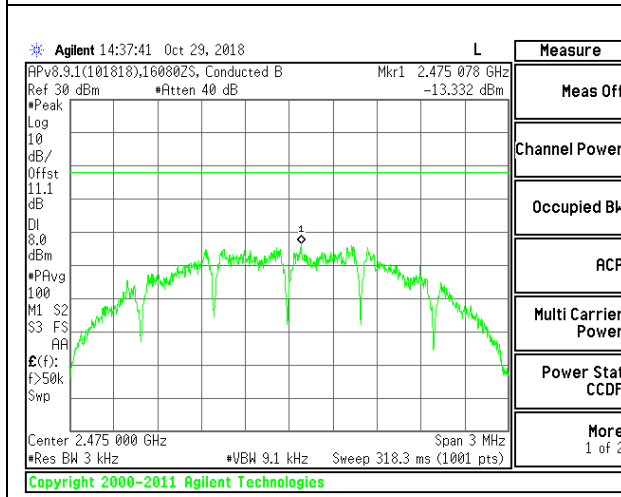
Channel	Frequency (MHz)	Chain 0 Meas (dBm/3kHz)	Total Corr'd PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low 11	2405	-13.857	-13.86	8.0	-21.9
Mid 18	2440	-15.443	-15.44	8.0	-23.4
High 25	2475	-13.332	-13.33	8.0	-21.3
High 26	2480	-15.584	-15.58	9.0	-24.6



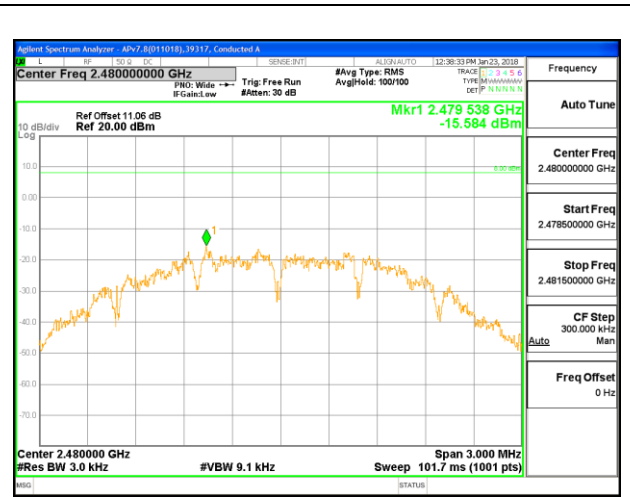
LOW CHANNEL 11



MID CHANNEL 18



HIGH CHANNEL 25



HIGH CHANNEL 26

8.7. CONDUCTED SPURIOUS EMISSIONS

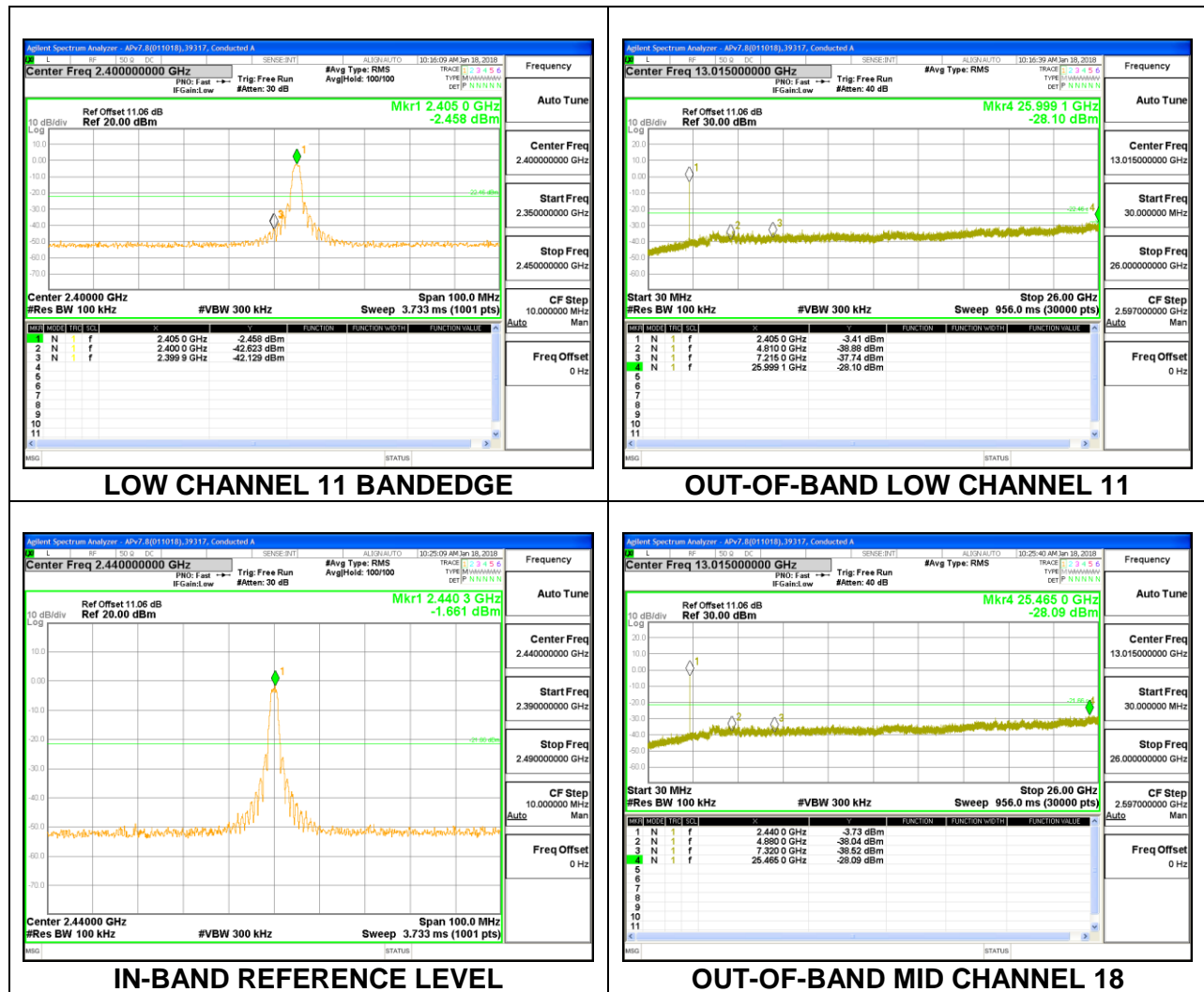
LIMITS

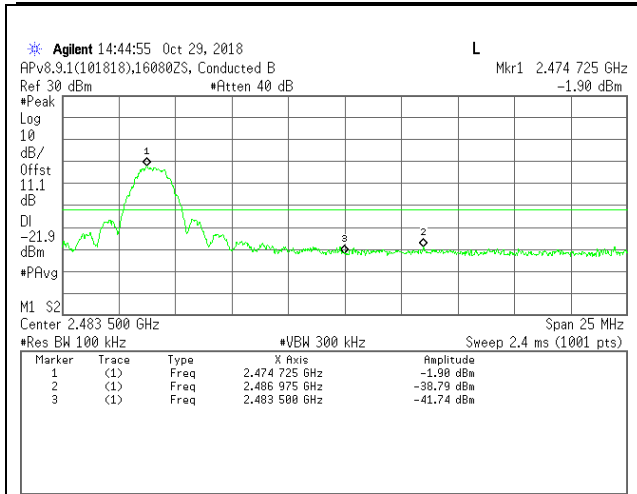
FCC §15.247 (d)

RSS-247 5.5

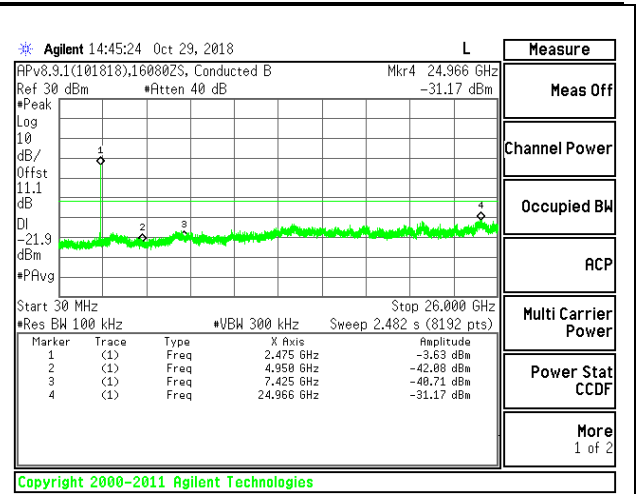
Output power was measured based on the use of peak measurement, therefore the required attenuation is 20 dB.

RESULTS

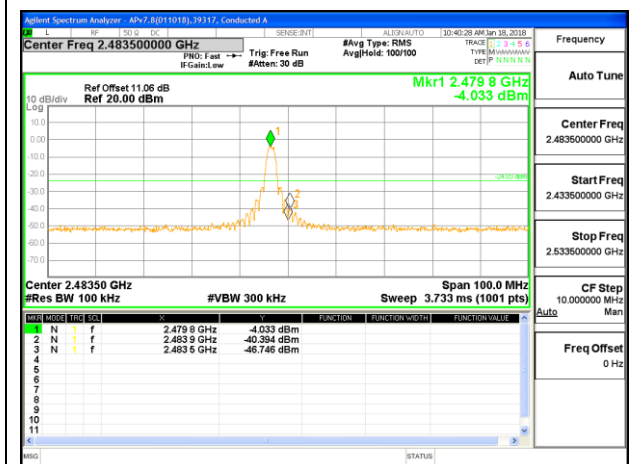




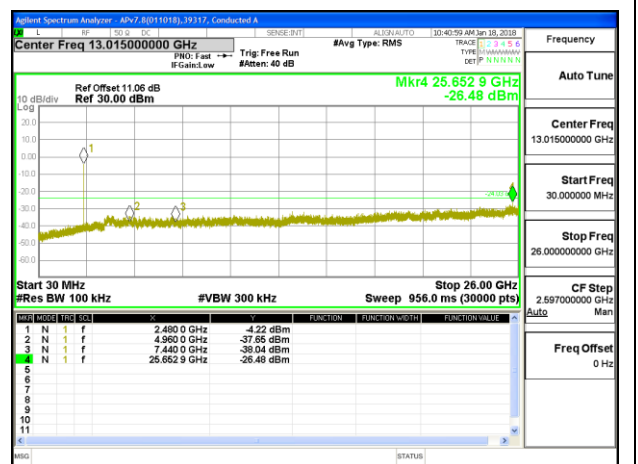
HIGH CHANNEL 25 BANDEDGE



OUT-OF-BAND LOW 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.

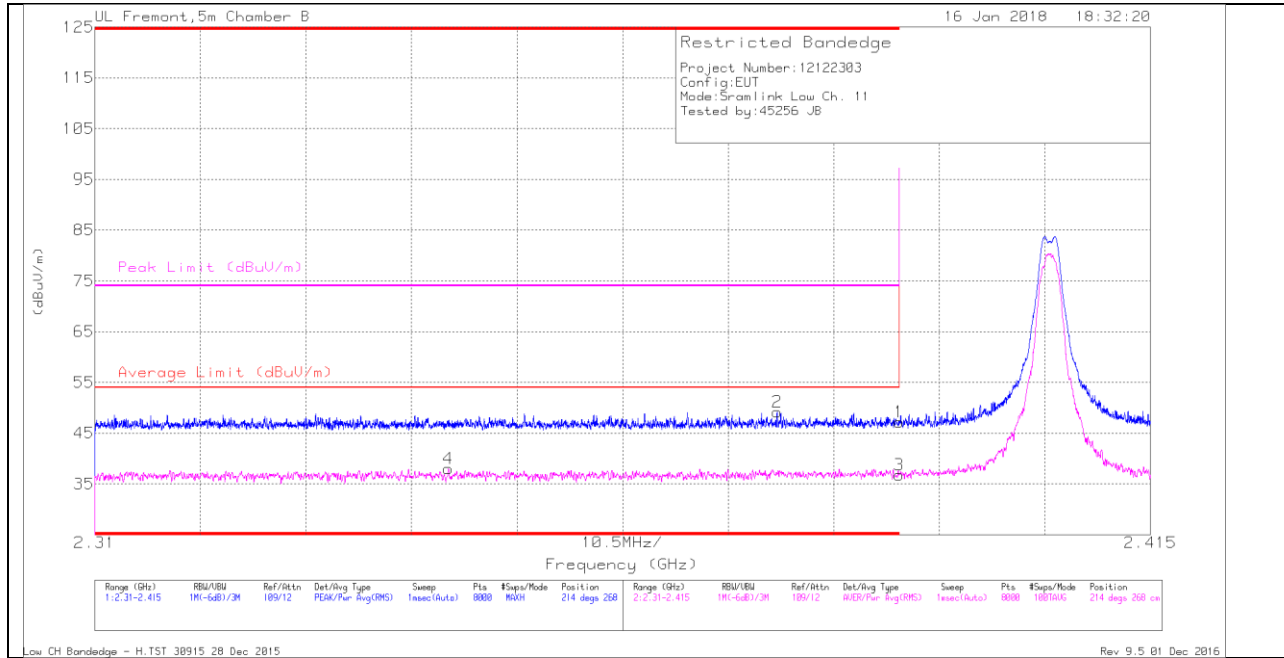
The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

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

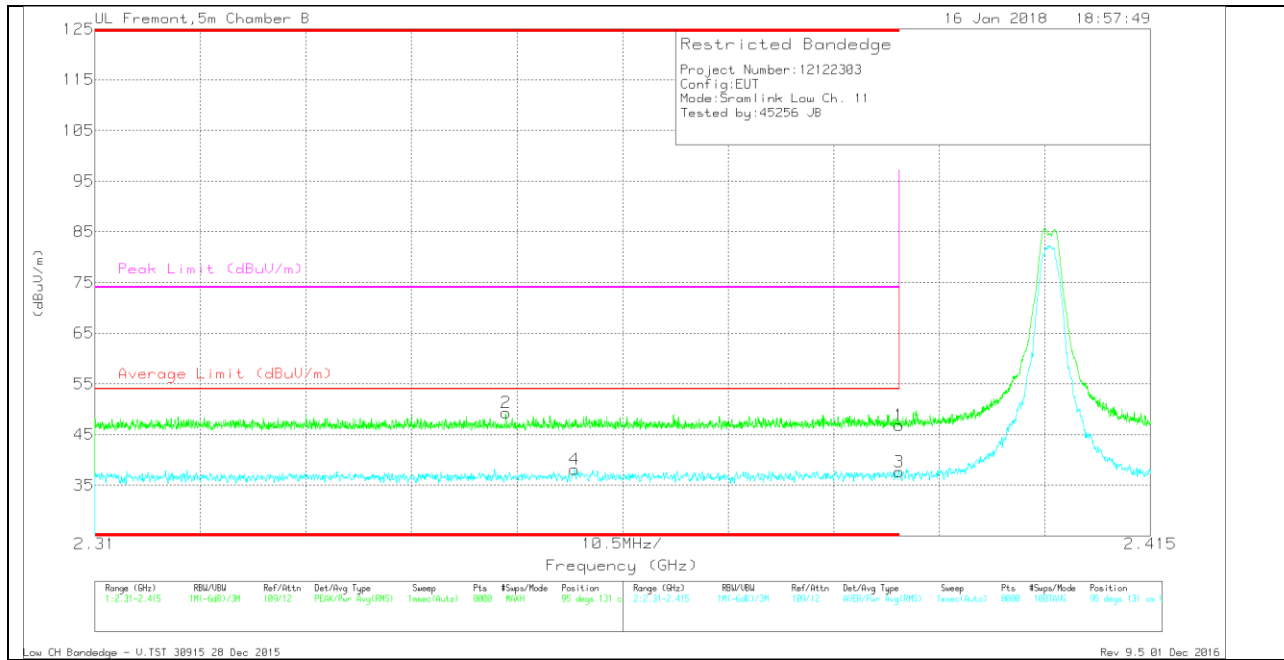
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	36.48	Pk	32	-21.3	47.18	-	-	74	-26.82	214	268	H
2	* 2.378	38.53	Pk	31.9	-21.3	49.13	-	-	74	-24.87	214	268	H
3	* 2.39	26.06	RMS	32	-21.3	36.76	54	-17.24	-	-	214	268	H
4	* 2.345	27.45	RMS	31.9	-21.3	38.05	54	-15.95	-	-	214	268	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)	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	36.13	Pk	32	-21.3	46.83	-	-	74	-27.17	95	131	V
2	* 2.351	38.94	Pk	31.8	-21.4	49.34	-	-	74	-24.66	95	131	V
3	* 2.39	26.89	RMS	32	-21.3	37.59	54	-16.41	-	-	95	131	V
4	* 2.358	27.48	RMS	31.9	-21.3	38.08	54	-15.92	-	-	95	131	V

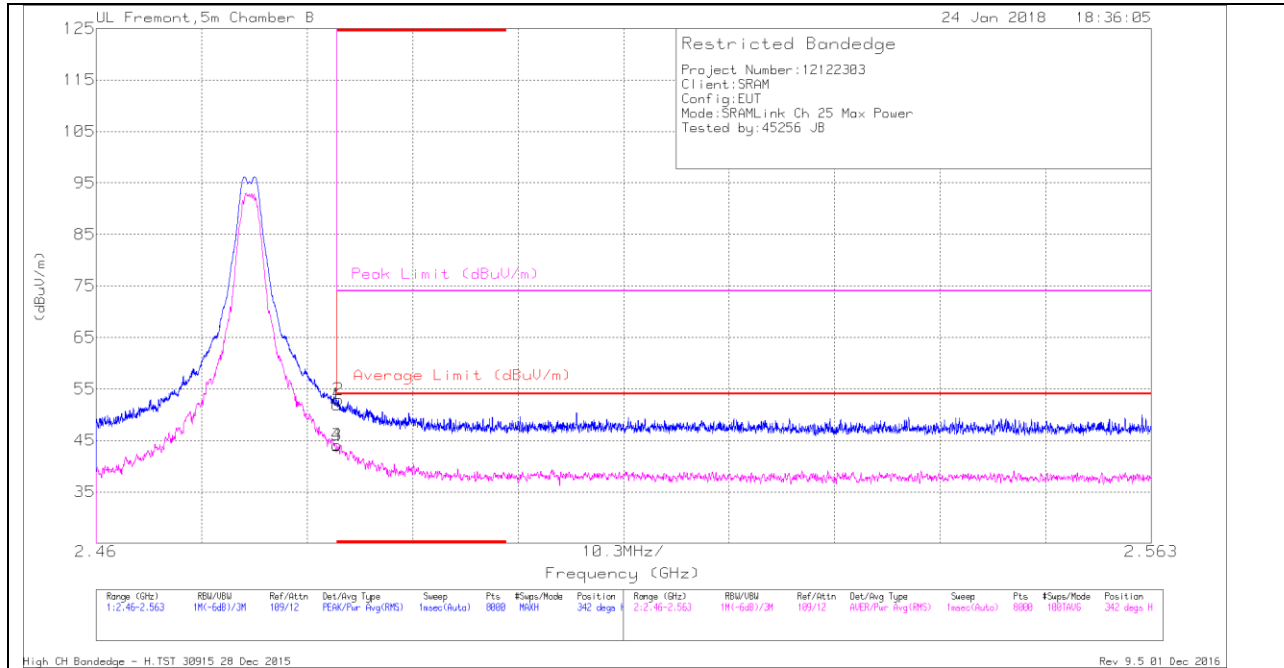
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL, CH 25)

HORIZONTAL RESULT



Trace Markers

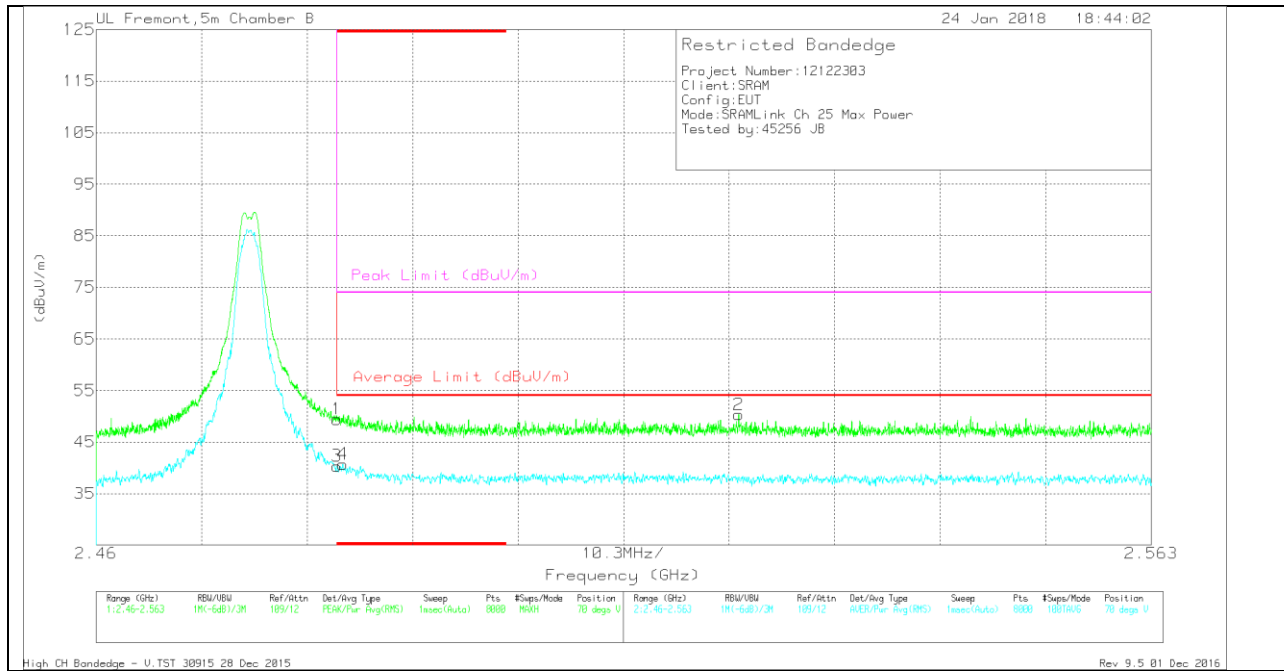
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.78	Pk	32.5	-21.3	51.98	-	-	74	-22.02	342	328	H
2	* 2.484	41.71	Pk	32.5	-21.3	52.91	-	-	74	-21.09	342	328	H
3	* 2.484	32.86	RMS	32.5	-21.3	44.06	54	-9.94	-	-	342	328	H
4	* 2.484	32.91	RMS	32.5	-21.3	44.11	54	-9.89	-	-	342	328	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



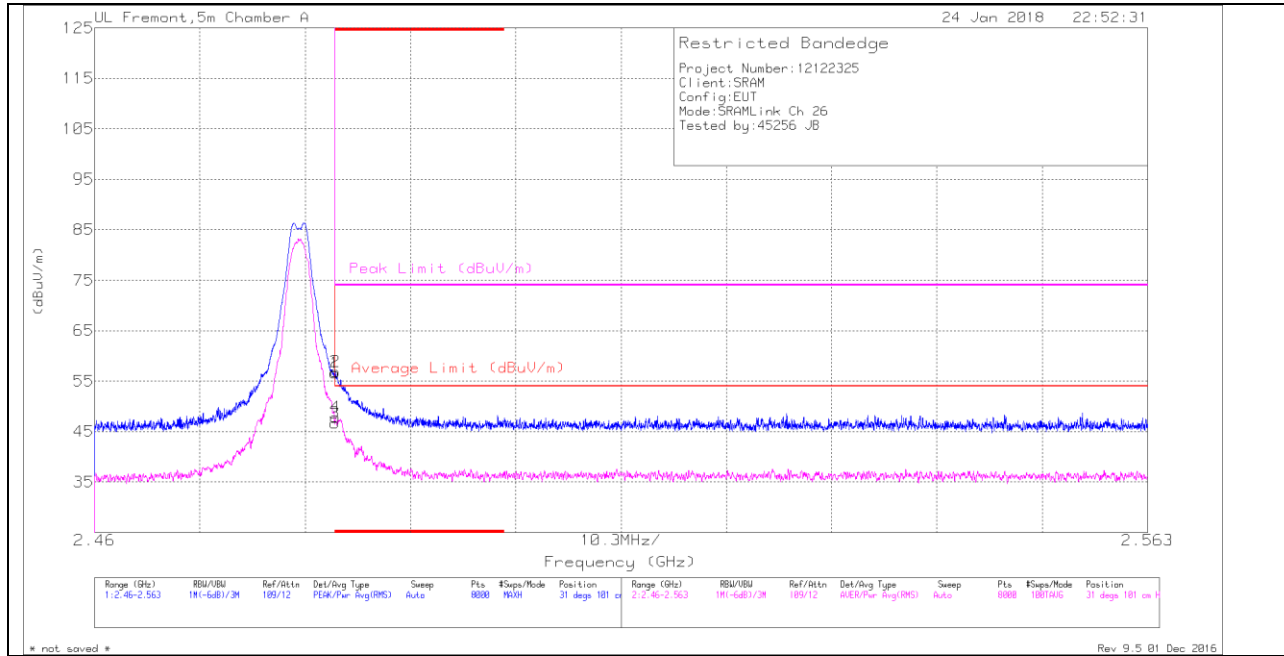
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	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	38.22	Pk	32.5	-21.3	49.42	-	-	74	-24.58	70	368	V
3	* 2.484	29.14	RMS	32.5	-21.3	40.34	54	-13.66	-	-	70	368	V
4	* 2.484	29.5	RMS	32.5	-21.3	40.7	54	-13.3	-	-	70	368	V
2	2.523	38.83	Pk	32.6	-21.1	50.33	-	-	74	-23.67	70	368	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

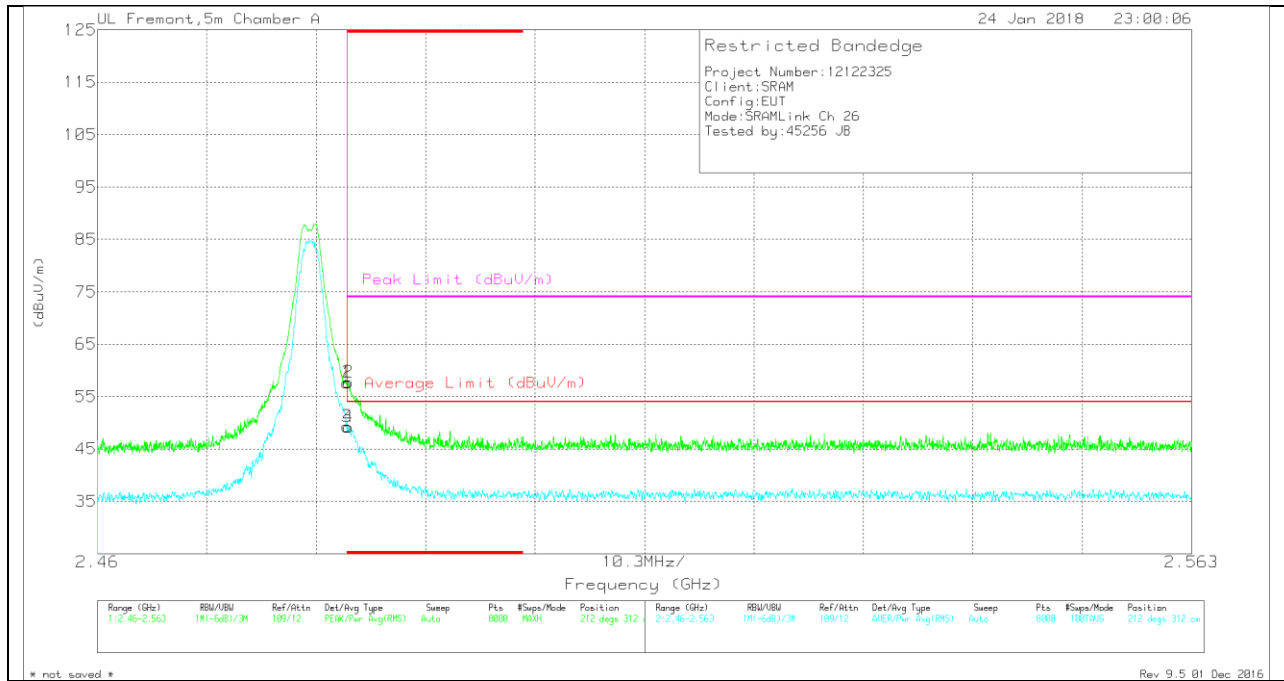
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	47.56	Pk	32.3	-23.2	56.66	-	-	74	-17.34	31	101	H
2	* 2.484	47.82	Pk	32.3	-23.2	56.92	-	-	74	-17.08	31	101	H
3	* 2.484	37.63	RMS	32.3	-23.2	46.73	54	-7.27	-	-	31	101	H
4	* 2.484	38.66	RMS	32.3	-23.2	47.76	54	-6.24	-	-	31	101	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/Cbl/Filtr/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	48.51	Pk	32.3	-23.2	57.61	-	-	74	-16.39	212	312	V
2	* 2.484	48.64	Pk	32.3	-23.2	57.74	-	-	74	-16.26	212	312	V
3	* 2.484	40.21	RMS	32.3	-23.2	49.31	54	-4.69	-	-	212	312	V
4	* 2.484	40.11	RMS	32.3	-23.2	49.21	54	-4.79	-	-	212	312	V

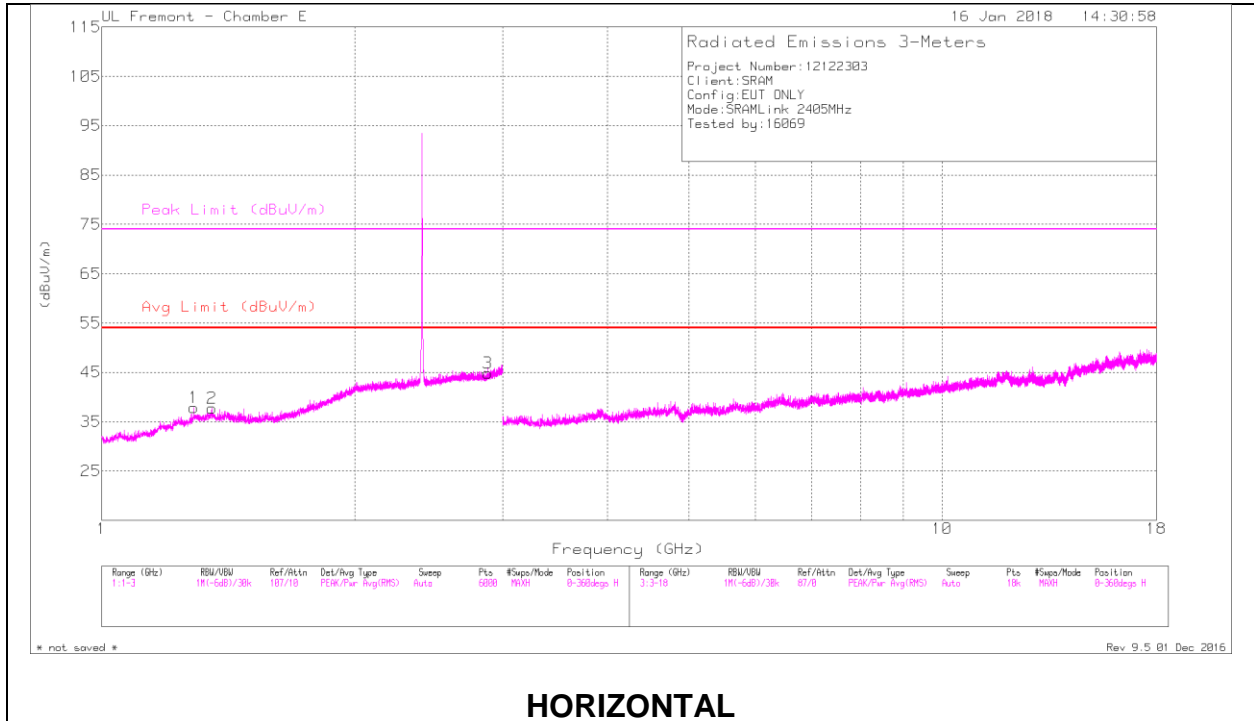
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

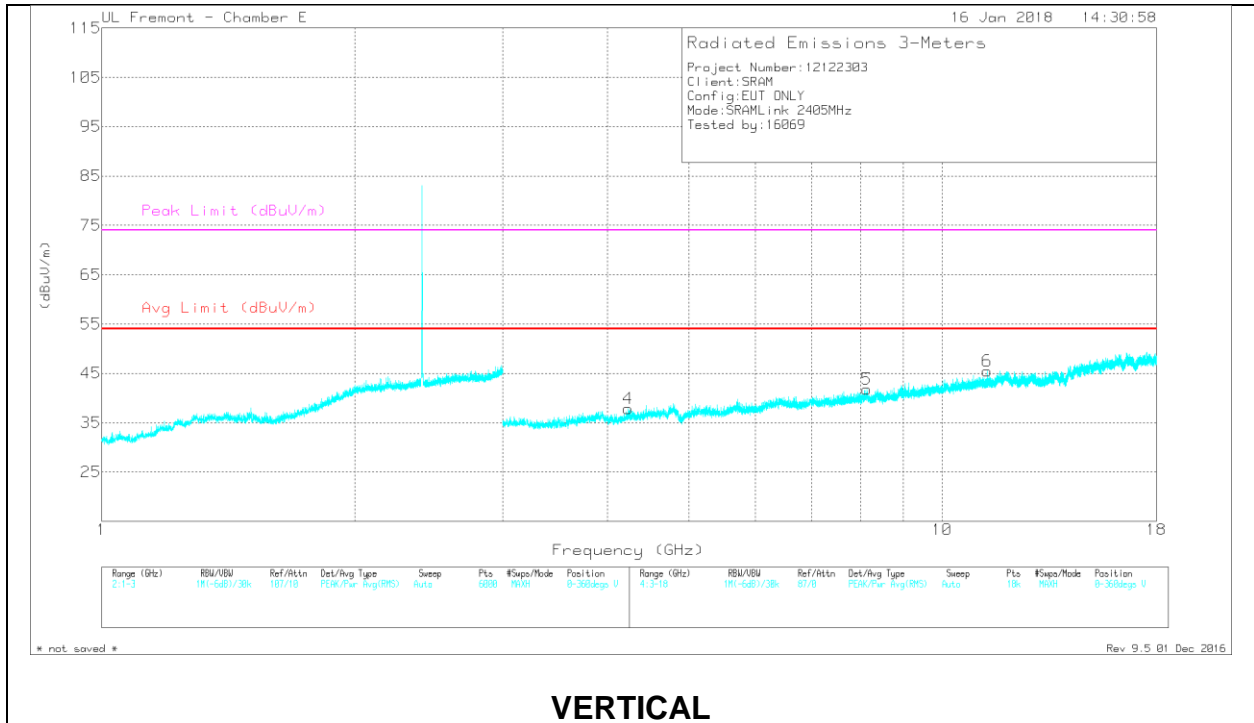
RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL, CH 11 RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

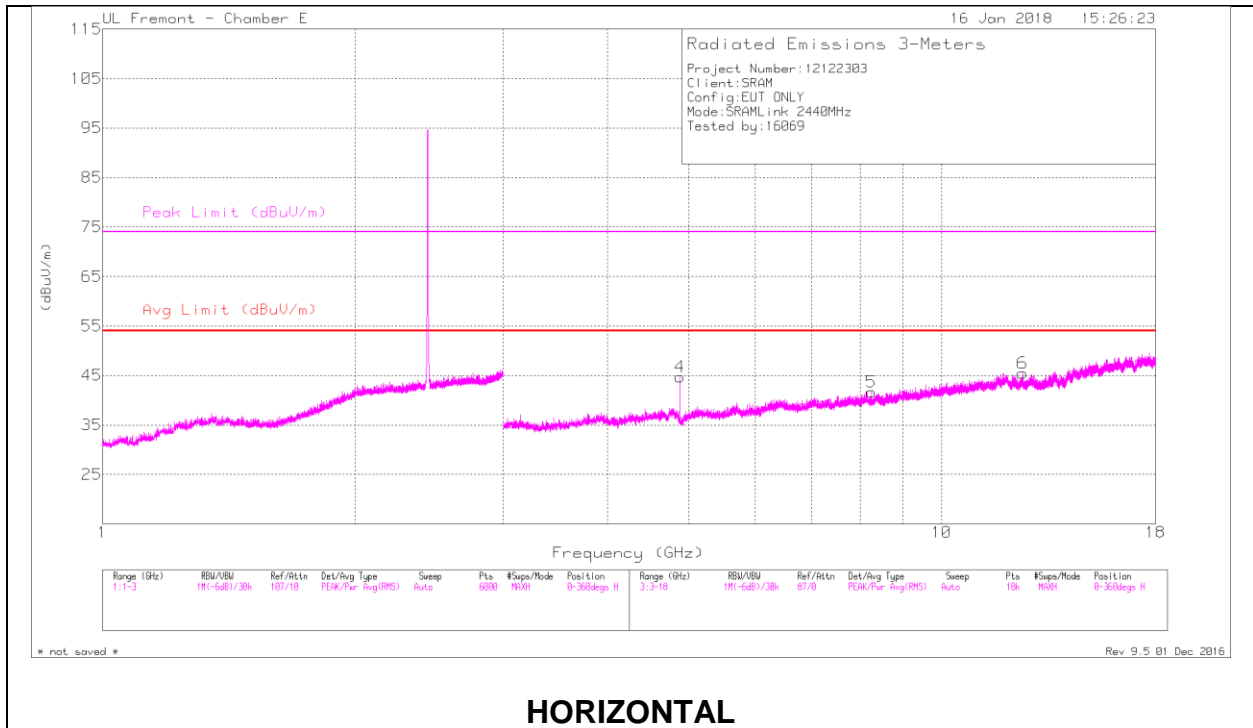
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.285	36.58	PK2	28.8	-21.6	43.78	-	-	74	-30.22	0	100	H
	* 1.287	24.29	MAv1	28.8	-21.6	31.49	54	-22.51	-	-	0	100	H
2	* 1.352	35.69	PK2	28.8	-21.4	43.09	-	-	74	-30.91	0	199	H
	* 1.353	24.28	MAv1	28.8	-21.4	31.68	54	-22.32	-	-	0	199	H
3	* 2.88	36.85	PK2	32.8	-19.1	50.55	-	-	74	-23.45	0	199	H
	* 2.88	25.32	MAv1	32.8	-19.1	39.02	54	-14.98	-	-	0	199	H
4	* 4.234	38.41	PK2	33.8	-28.6	43.61	-	-	74	-30.39	0	199	V
	* 4.234	27.69	MAv1	33.8	-28.6	32.89	54	-21.11	-	-	0	199	V
5	* 8.141	35.85	PK2	36.5	-25.2	47.15	-	-	74	-26.85	0	199	V
	* 8.143	25.22	MAv1	36.5	-25.2	36.52	54	-17.48	-	-	0	199	V
6	* 11.321	35.23	PK2	38.7	-22.9	51.03	-	-	74	-22.97	0	100	V
	* 11.321	25.76	MAv1	38.7	-22.9	41.56	54	-12.44	-	-	0	100	V

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

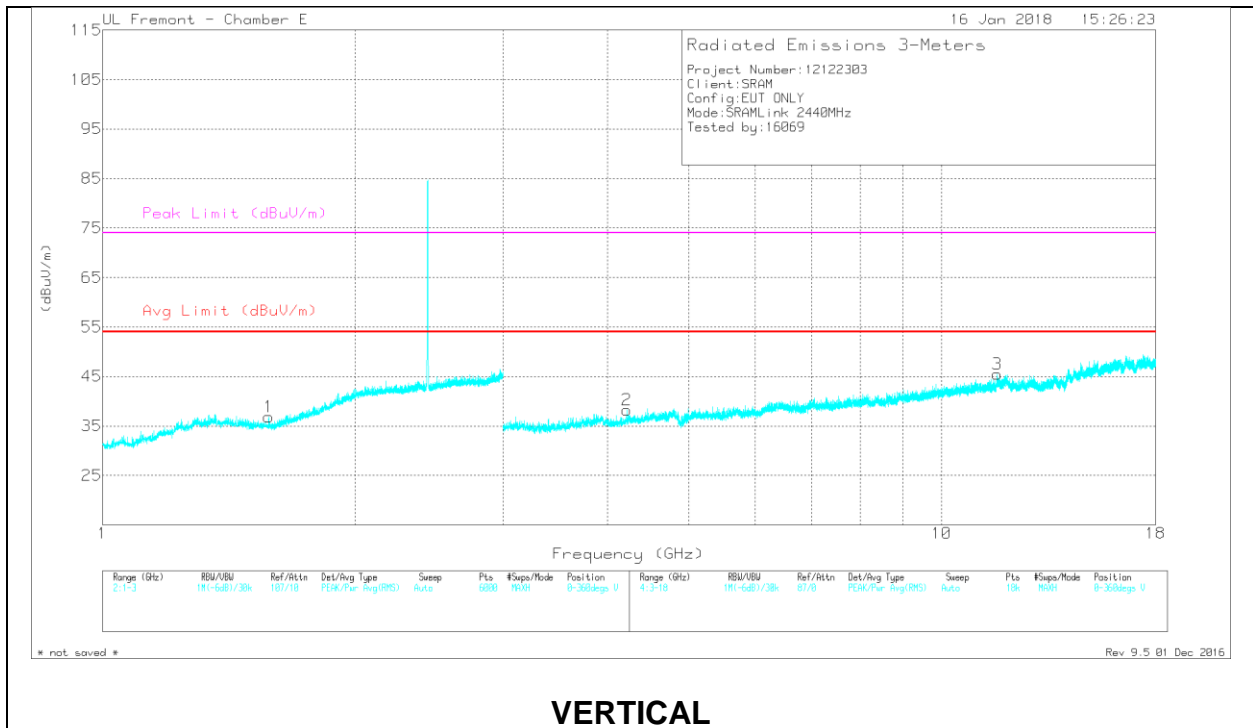
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL, CH 18 RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

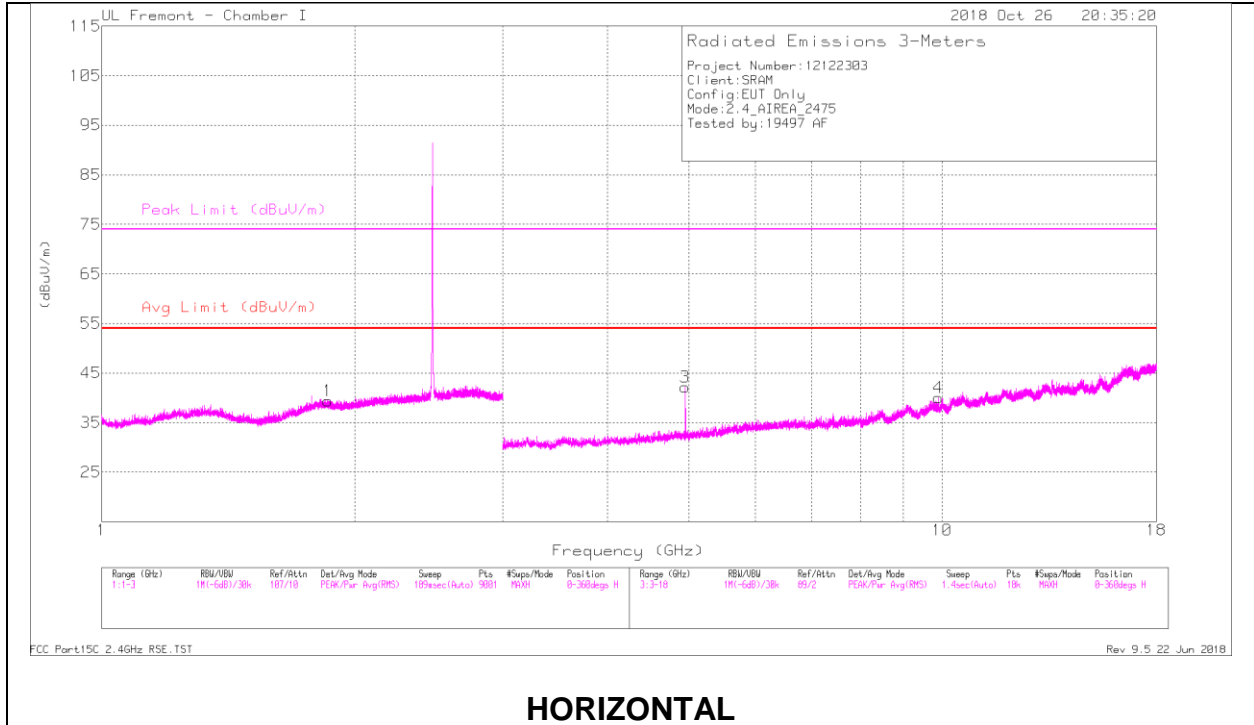
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Ftr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.578	35.74	PK2	27.3	-20.7	42.34	-	-	74	-31.66	0	100	V
	* 1.576	24.04	MAv1	27.3	-20.8	30.54	54	-23.46	-	-	0	100	V
5	* 8.247	36.87	PK2	36.5	-26.2	47.17	-	-	74	-26.83	0	100	H
	* 8.249	25.73	MAv1	36.5	-26.2	36.03	54	-17.97	-	-	0	100	H
6	* 12.495	34.6	PK2	39	-22.6	51	-	-	74	-23	0	100	H
	* 12.495	23.94	MAv1	39	-22.6	40.34	54	-13.66	-	-	0	100	H
2	* 4.879	38.67	PK2	34.5	-29.6	43.57	-	-	74	-30.43	339	399	H
	* 4.881	27.32	MAv1	34.5	-29.7	32.12	54	-21.88	-	-	339	399	H
4	* 4.219	39.18	PK2	33.7	-28.6	44.28	-	-	74	-29.72	0	100	V
	* 4.216	27.54	MAv1	33.7	-28.6	32.64	54	-21.36	-	-	0	100	V
3	* 11.651	34.63	PK2	38.9	-22.4	51.13	-	-	74	-22.87	0	100	V
	* 11.653	23.57	MAv1	38.9	-22.4	40.07	54	-13.93	-	-	0	100	V

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

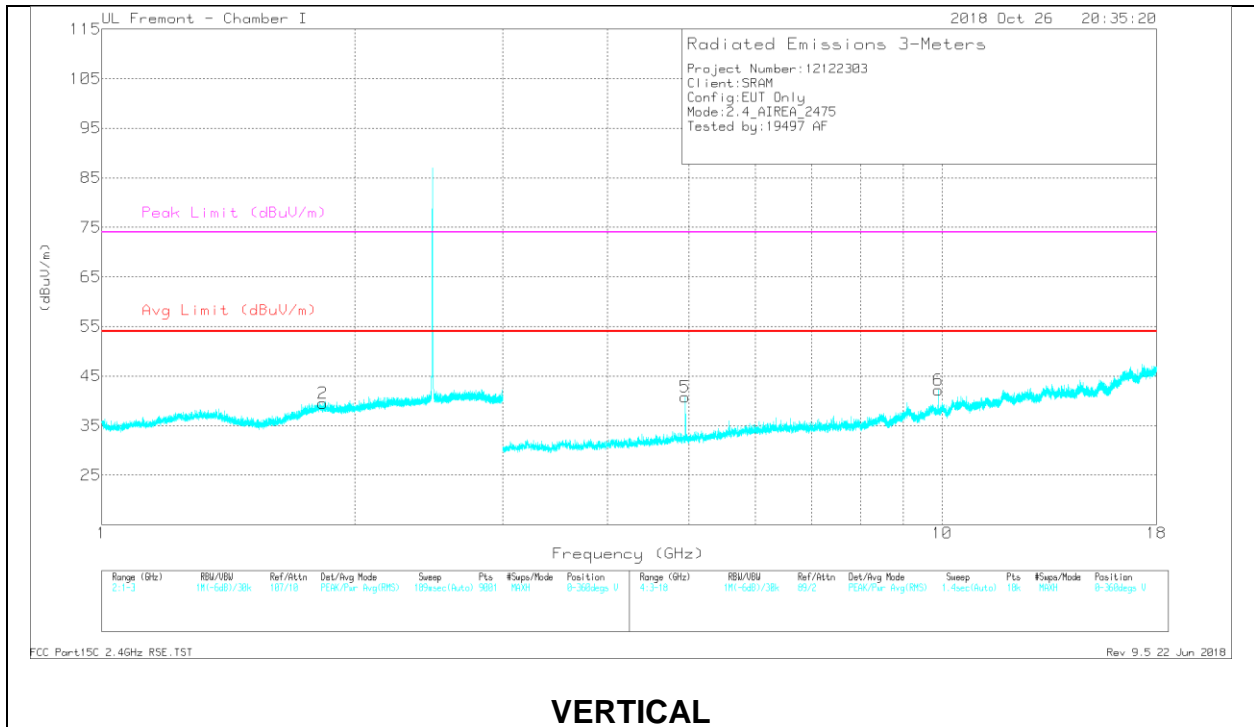
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

HIGH CHANNEL, CH 25 RESULTS



HORIZONTAL



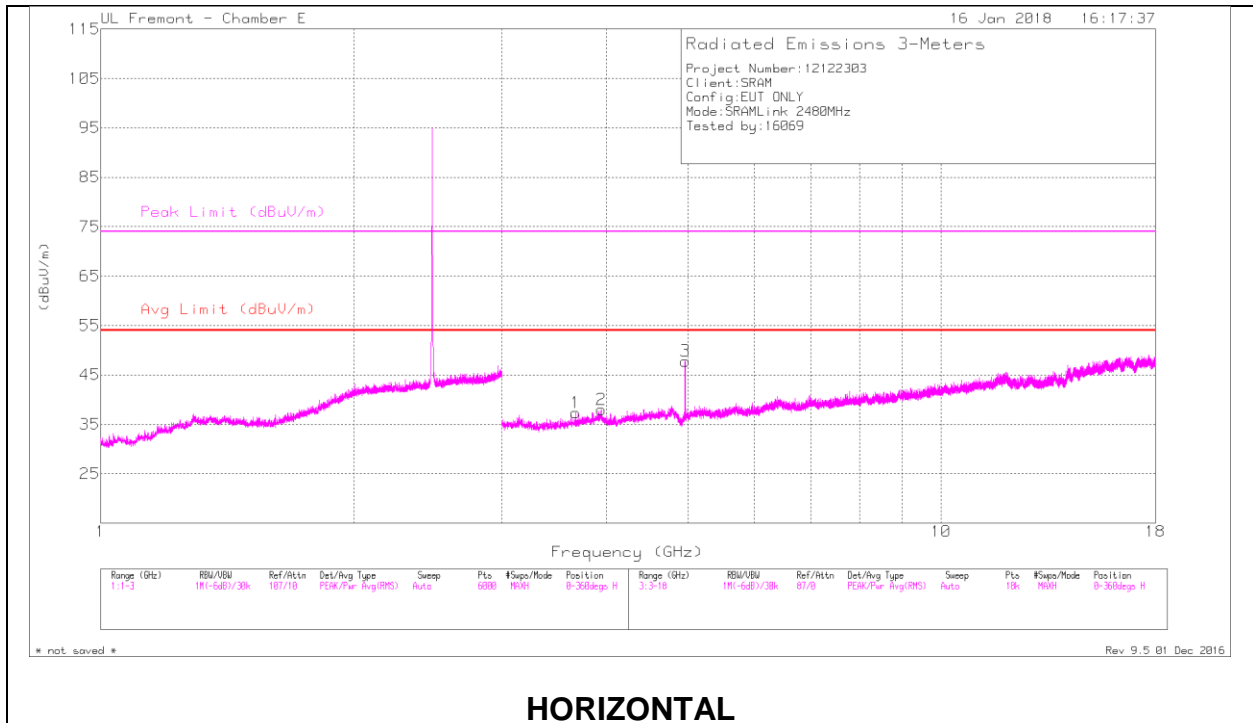
VERTICAL

RADIATED EMISSIONS

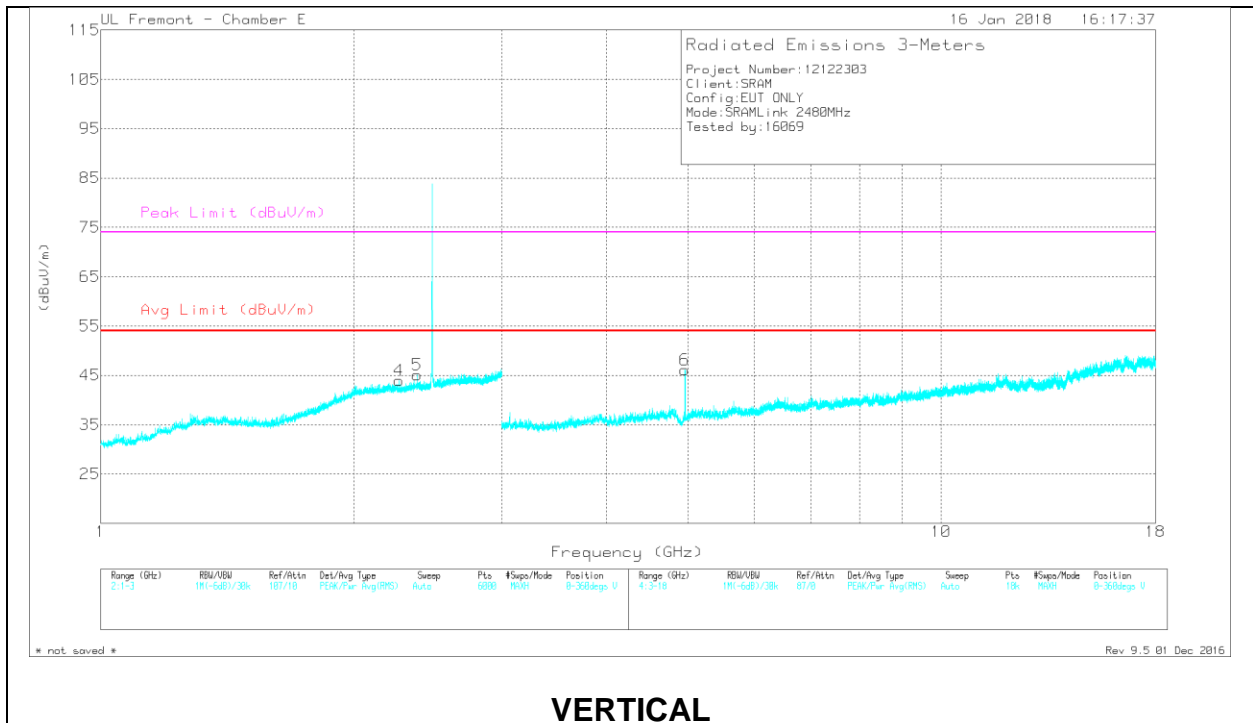
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.857	37.85	PK2	30.8	-22.3	46.35	-	-	-	-	269	169	H
2	1.833	38.03	PK2	30.7	-22.2	46.53	-	-	-	-	272	171	V
3	* 4.949	42	PK2	34.2	-29.1	47.1	-	-	74	-26.9	331	100	H
	* 4.951	34.89	MAv1	34.2	-29.1	39.99	54	-14.01	-	-	331	100	H
4	9.898	31.78	PK2	37	-21.9	46.88	-	-	-	-	238	115	H
5	* 4.949	37.27	PK2	34.2	-29.1	42.37	-	-	74	-31.63	266	182	V
6	* 4.951	28.51	MAv1	34.2	-29.1	33.61	54	-20.39	-	-	266	182	V
	9.898	29.93	PK2	37	-21.9	45.03	-	-	-	-	342	265	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

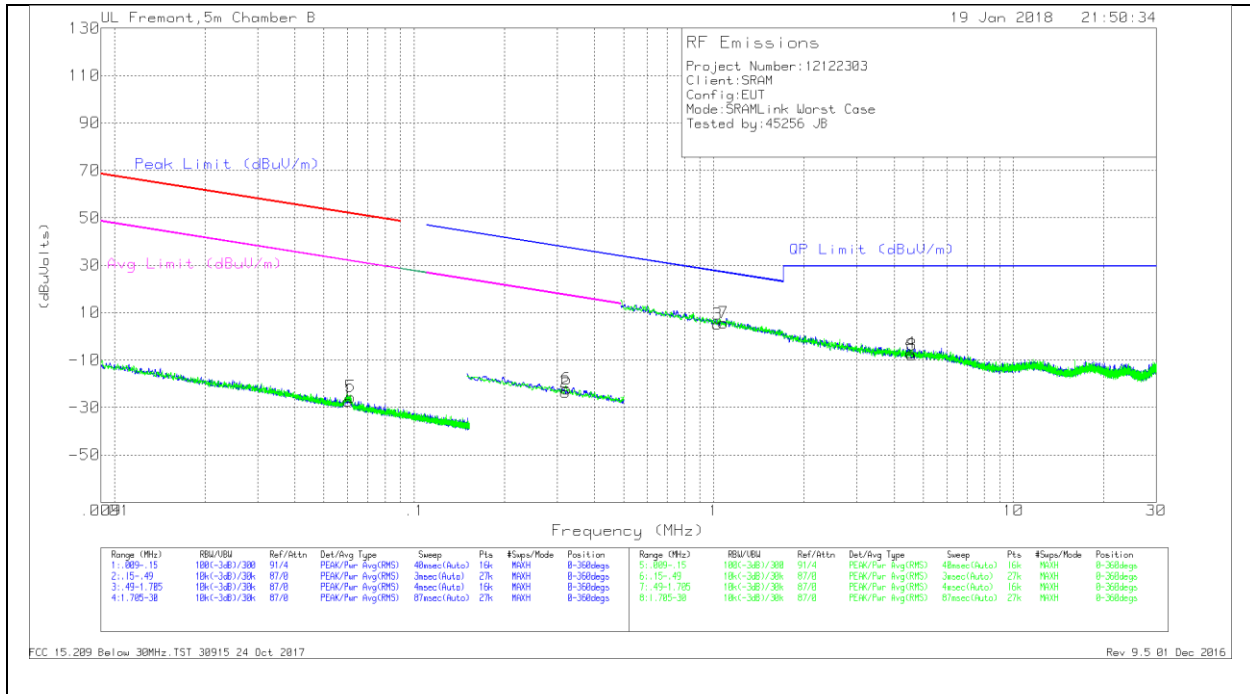
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T346 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 2.265	36.15	PK2	31.8	-19.4	48.55	-	-	74	-25.45	78	147	V
	* 2.264	24.72	MAv1	31.8	-19.4	37.12	54	-16.88	-	-	78	147	V
5	* 2.382	36.85	PK2	31.9	-19.3	49.45	-	-	74	-24.55	78	147	V
	* 2.38	25.22	MAv1	31.9	-19.3	37.82	54	-16.18	-	-	78	147	V
3	* 4.961	47.45	PK2	34.5	-29.7	52.25	-	-	74	-21.75	356	103	H
	* 4.959	40.57	MAv1	34.5	-29.7	45.37	54	-8.63	-	-	356	103	H
1	* 3.674	38.97	PK2	33.5	-29.6	42.87	-	-	74	-31.13	78	147	H
	* 3.672	27.87	MAv1	33.5	-29.6	31.77	54	-22.23	-	-	78	147	H
2	* 3.942	38.93	PK2	33.7	-28.9	43.73	-	-	74	-30.27	78	147	H
	* 3.943	28.16	MAv1	33.7	-28.9	32.96	54	-21.04	-	-	78	147	H
6	* 4.959	45.06	PK2	34.5	-29.7	49.86	-	-	74	-24.14	78	147	V
	* 4.959	37.74	MAv1	34.5	-29.7	42.54	54	-11.46	-	-	78	147	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



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

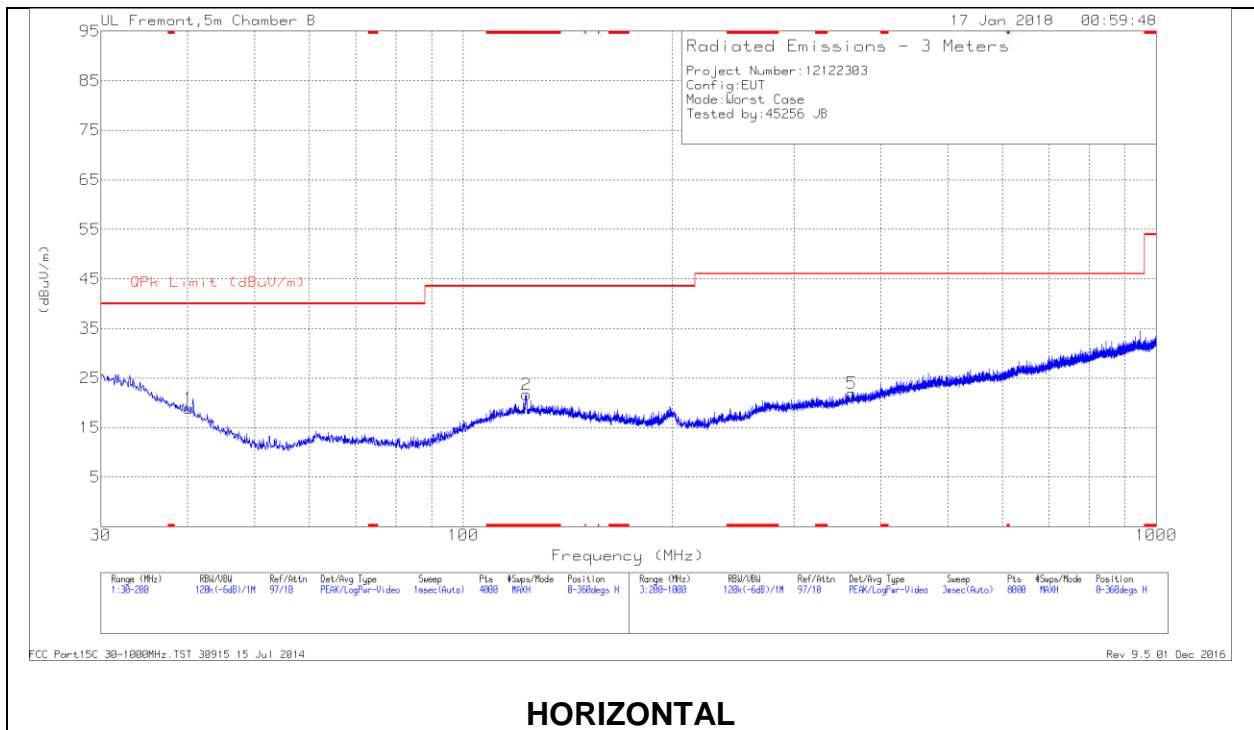
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.0602	36.87	Pk	14.5	1.4	-80	-27.23	51.99	-79.22	31.99	-59.22	-	-	-	-	0-360
5	.06144	38.57	Pk	14.5	1.4	-80	-26.53	51.82	-77.35	31.82	-57.35	-	-	-	-	0-360
2	.3197	41.1	Pk	13.8	1.5	-80	-23.6	-	-	-	-	37.52	-61.12	17.52	-41.12	0-360
6	.3228	42.52	Pk	13.8	1.5	-80	-22.18	-	-	-	-	37.43	-59.61	17.43	-39.61	0-360

Pk - Peak detector

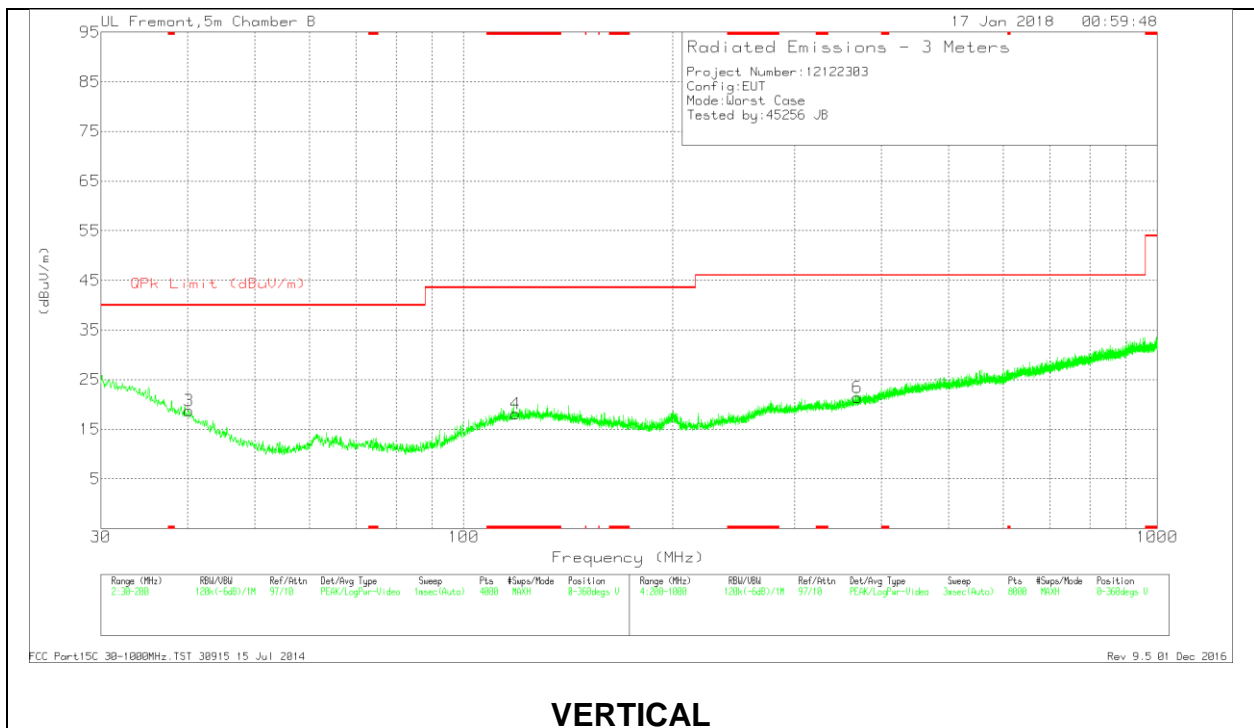
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.02755	29.39	Pk	14.3	1.5	-40	5.19	27.39	-22.2	0-360
7	1.07832	29.83	Pk	14.3	1.5	-40	5.63	26.97	-21.34	0-360
4	4.54927	16.93	Pk	14.4	1.5	-40	-7.17	29.5	-36.67	0-360
8	4.58805	16.16	Pk	14.4	1.5	-40	-7.94	29.5	-37.44	0-360

Pk - Peak detector

9.3. Worst Case Below 1 GHz



HORIZONTAL

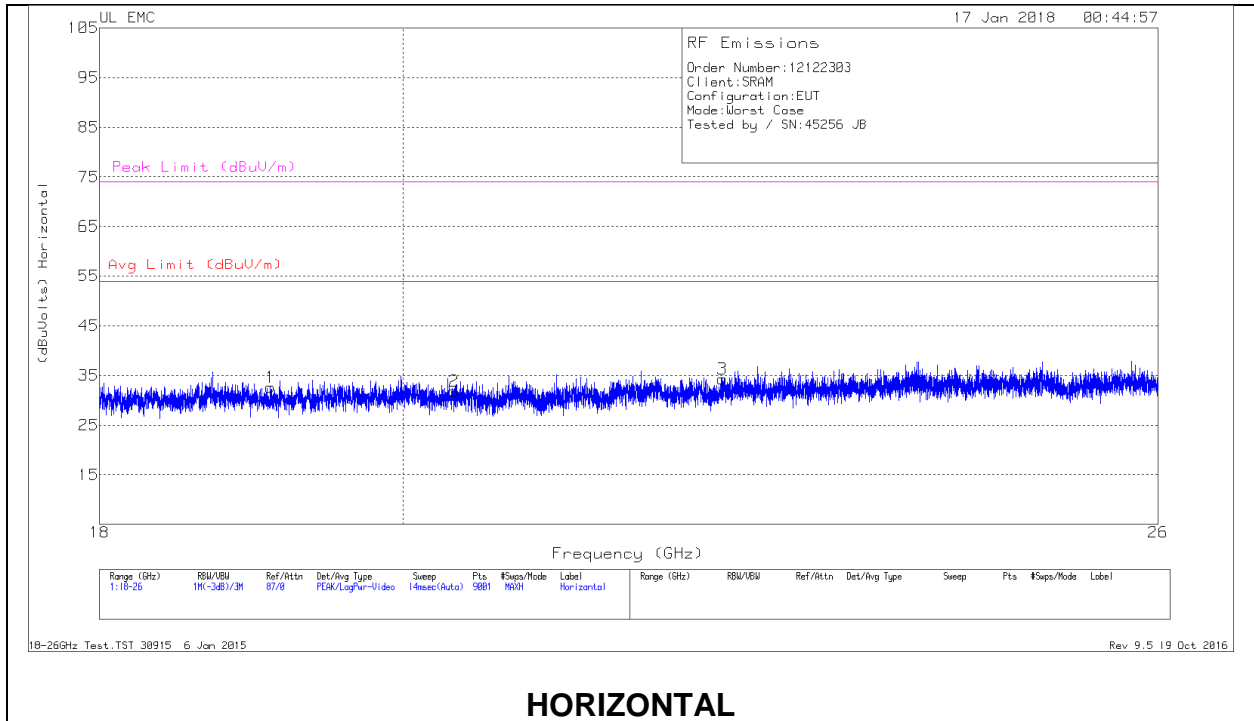


VERTICAL

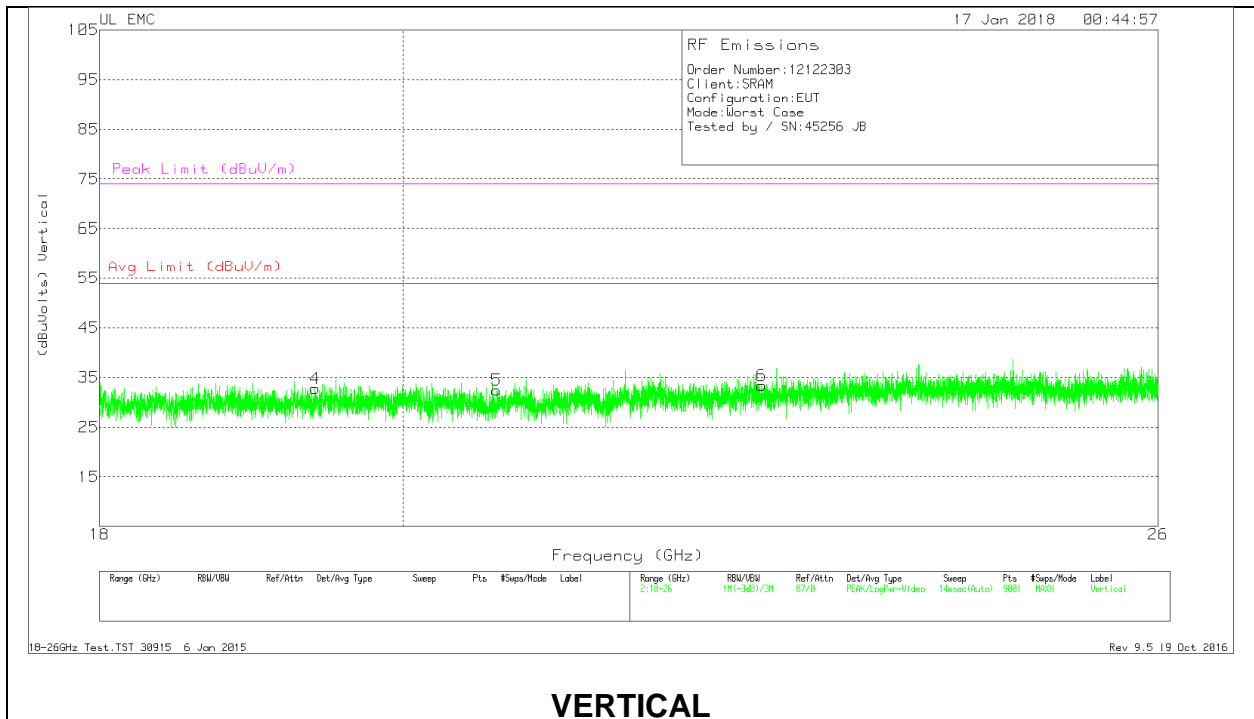
Below 1GHz DATA

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	* 123.3967	31.65	Pk	17.7	-27.7	21.65	43.52	-21.87	0-360	200	H
4	* 118.848	28.18	Pk	17.6	-27.7	18.08	43.52	-25.44	0-360	100	V
1	40.1601	29.5	Pk	18.1	-28.7	18.9	40	-21.1	0-360	300	H
3	40.1601	29.4	Pk	18.1	-28.7	18.8	40	-21.2	0-360	100	V
5	363.8213	29.12	Pk	18.7	-25.9	21.92	46.02	-24.1	0-360	400	H
6	369.322	28.47	Pk	18.9	-25.9	21.47	46.02	-24.55	0-360	100	V

9.4. Worst Case 18-26 GHz



HORIZONTAL



VERTICAL

18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	T89 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Corrected Reading (dBuVolts)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)
1	19.1	34.92	Pk	32.2	-25	-9.5	32.62	54	-21.38	74	-41.38
2	20.357	34.06	Pk	32.6	-25.3	-9.5	31.86	54	-22.14	74	-42.14
3	22.347	35.52	Pk	33	-24.7	-9.5	34.32	54	-19.68	74	-39.68
4	19.398	34.96	Pk	32.4	-25.1	-9.5	32.76	54	-21.24	74	-41.24
5	20.661	34.42	Pk	32.7	-25.2	-9.5	32.42	54	-21.58	74	-41.58
6	22.653	34.58	Pk	33.3	-25	-9.5	33.38	54	-20.62	74	-40.62