



CERTIFICATION TEST REPORT

Report Number. : 12509538-E6V1

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) : LP0002: 2018

Date Of Issue:
November 12, 2018

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REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	11/12/2018	Initial Issue	

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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 18th 2018 – March 5th 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
LP0002: 2018	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 NCC LP0002:2018, 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.
☐ Chamber A (IC:2324B-1)	☒ Chamber D (IC:22541-1)	☒ Chamber I (IC: 2324A-5)
☐ Chamber B (IC:2324B-2)	☐ Chamber E (IC:22541-2)	☐ Chamber J (IC: 2324A-6)
☐ Chamber C (IC:2324B-3)	☒ Chamber F (IC:22541-3)	☐ Chamber K (IC: 2324A-1)
	☐ Chamber G (IC:22541-4)	☐ Chamber L (IC: 2324A-3)
	☐ 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)
2402-2480	BLE	2.96	1.98	2.67	1.85

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

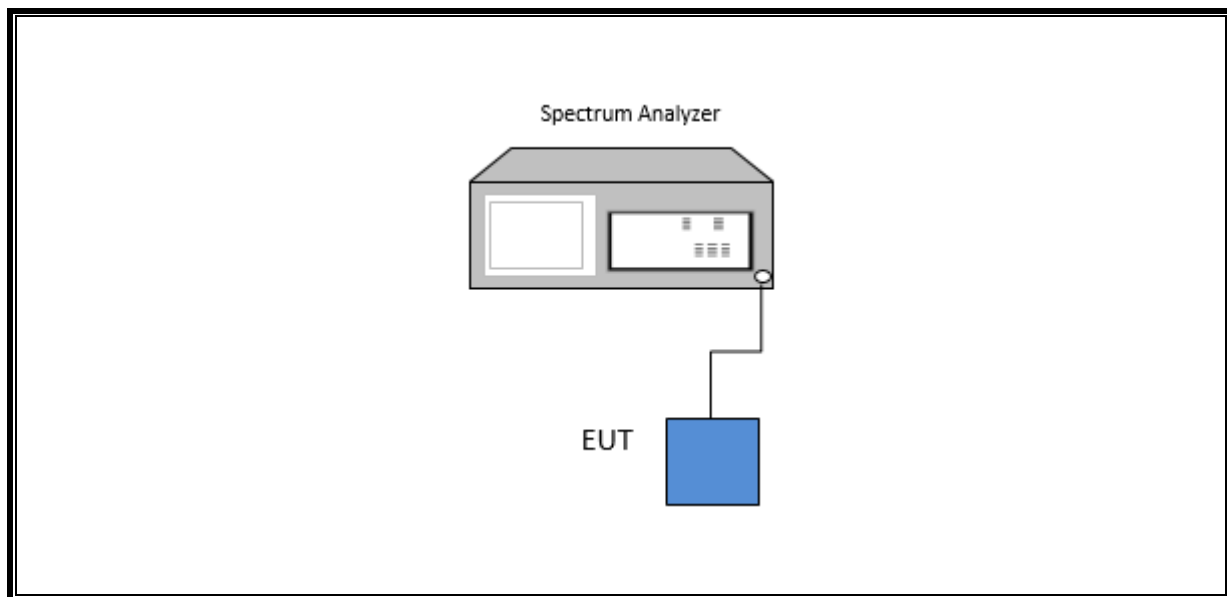
SUPPORT EQUIPMENT

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

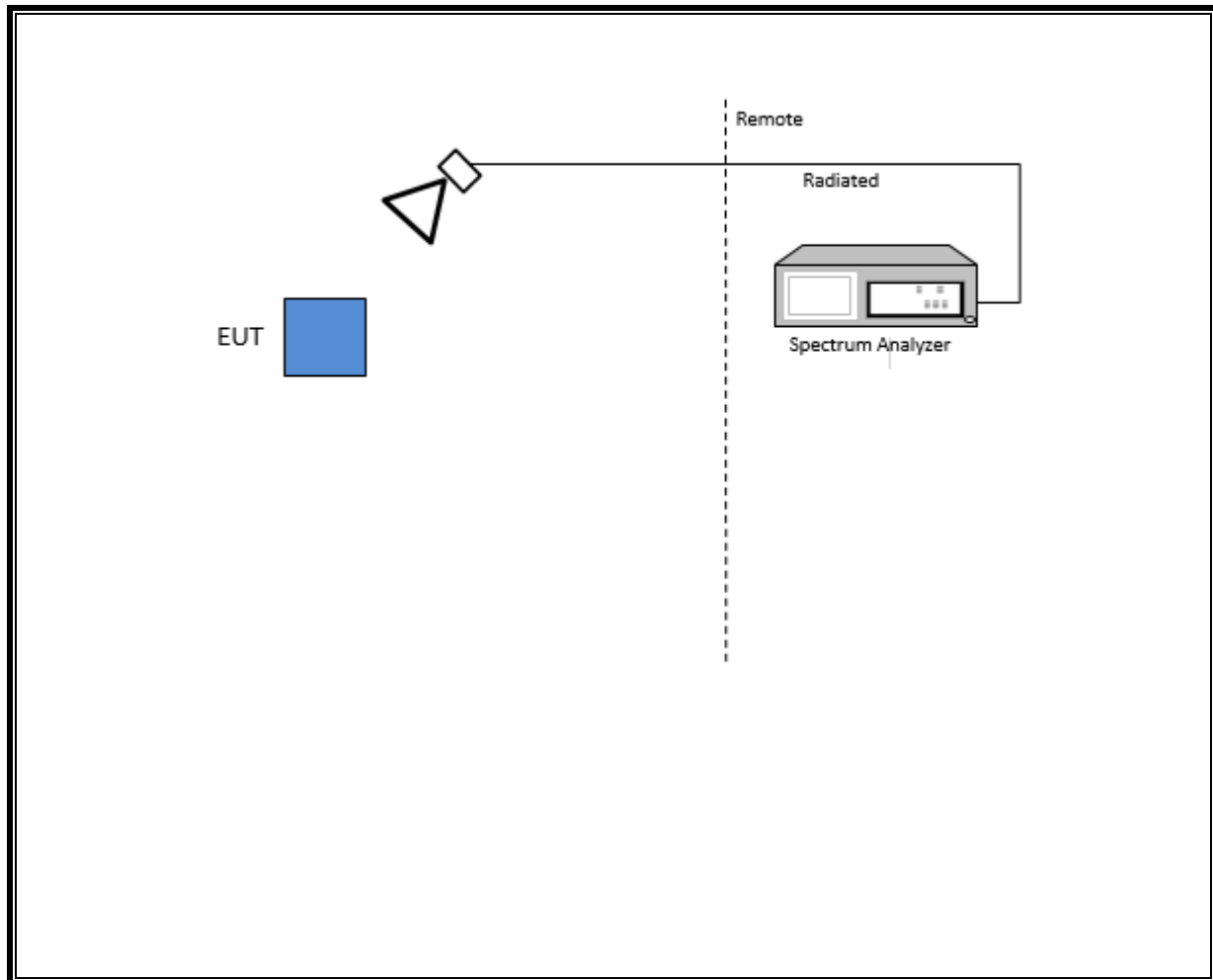
TEST SETUP

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:

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	T340	12/15/17	12/15/18
Antenna, Biconolog, 30MHz-1 GHz	Sunol Sciences	JB3	T408	12/15/17	12/15/18
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	AFT900	06/18/18	06/18/19
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T862	06/09/17	06/09/18
RF Preamplifier, 10kHz - 1GHz	Sonoma	310	T173	06/24/17	06/24/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T119	03/28/17	03/28/18
RF Preamplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T742	12/04/17	12/04/18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	T427	12/04/17	12/04/18
Spectrum Analyzer	Agilent	N9030A	T341	11/12/17	11/12/18
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T136	12/30/17	12/30/18
RF Preamplifier, 1 - 18GHz	Miteq	AFS42-00101800-25-S-42	T740	12/30/17	12/30/18
High Pass Filter 3GHz	Micro-Tronics	HPM17543	T428	12/30/17	12/30/18
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

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

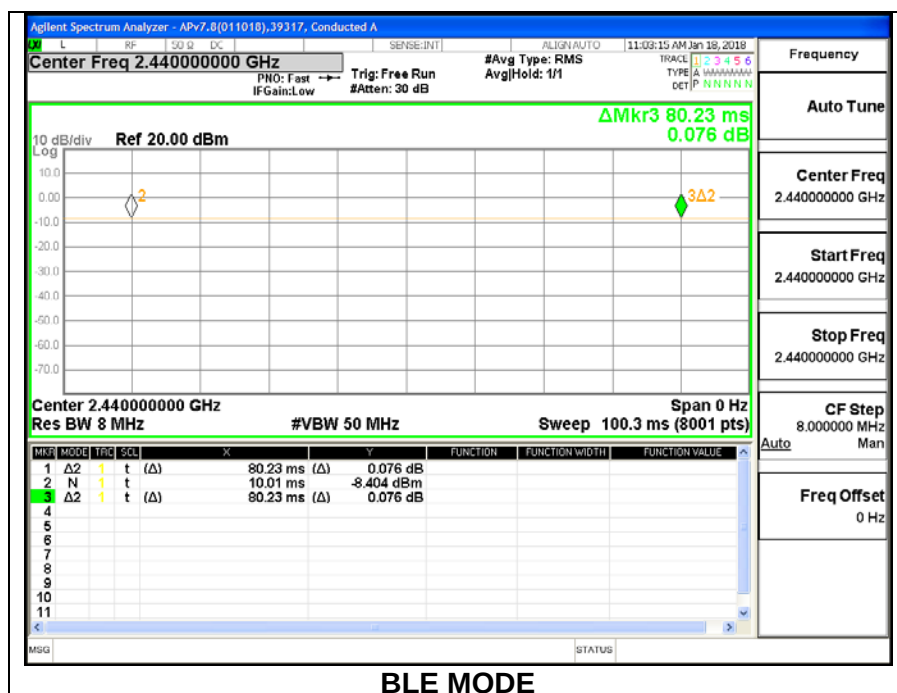
None; for reporting purposes only.

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)
BLE	80.2	80.2	1.000	100.00%	0.00	0.010



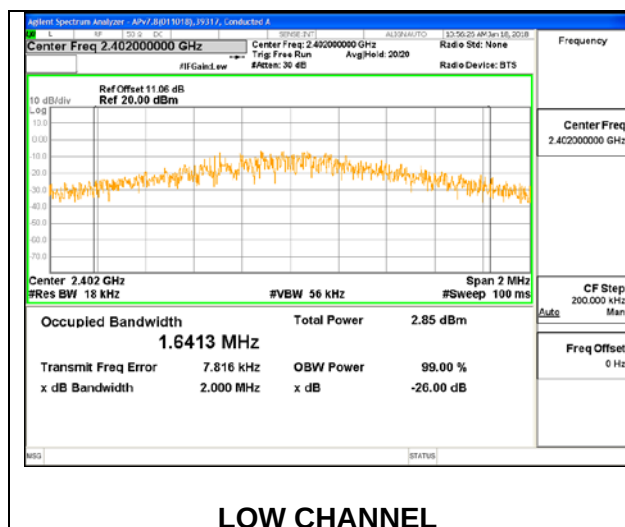
8.2. 99% BANDWIDTH

LIMITS

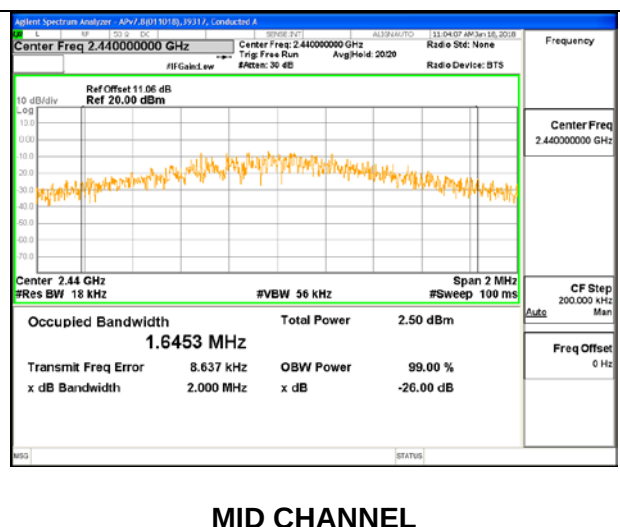
None; for reporting purposes only.

RESULTS

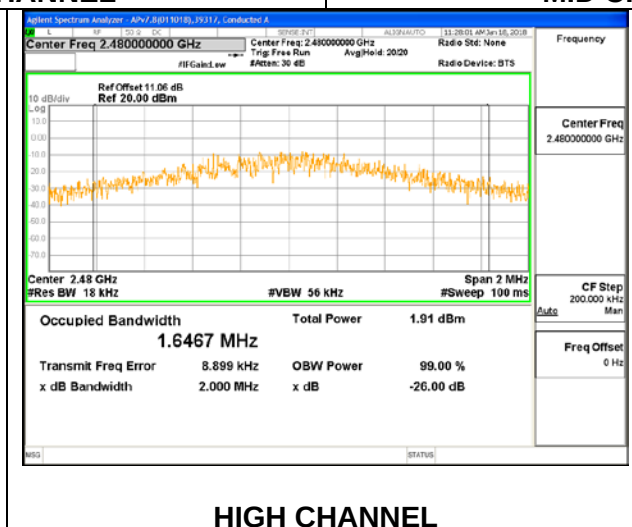
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2402	1.641
Middle	2440	1.645
High	2480	1.647



LOW CHANNEL



MID CHANNEL



HIGH CHANNEL

8.3. 6 dB BANDWIDTH

LIMITS

NCC LP002 3.10.1.6(2)(A)

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

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2402	0.826	0.5
Middle	2440	0.786	0.5
High	2480	0.862	0.5



8.4. OUTPUT POWER

LIMITS

NCC LP0002 3.10.1.2(1)(C)

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 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.

RESULTS

Tested By:	39317
Date:	01/31/18

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low	2402	2.960	30	-27.040
Middle	2440	2.490	30	-27.510
High	2480	2.060	30	-27.940

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

Tested By:	39317
Date:	01/26/18

Channel	Frequency (MHz)	AV power (dBm)
Low	2402	2.67
Middle	2440	2.24
High	2480	1.77

8.6. POWER SPECTRAL DENSITY

LIMITS

NCC LP0002 3.10.1.6(2)(B)

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

RESULTS

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low	2402	-10.27	8	-18.27
Middle	2440	-10.74	8	-18.74
High	2480	-11.30	8	-19.30



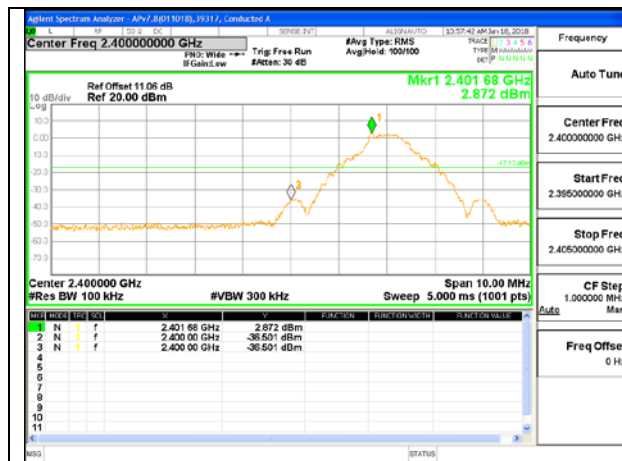
8.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

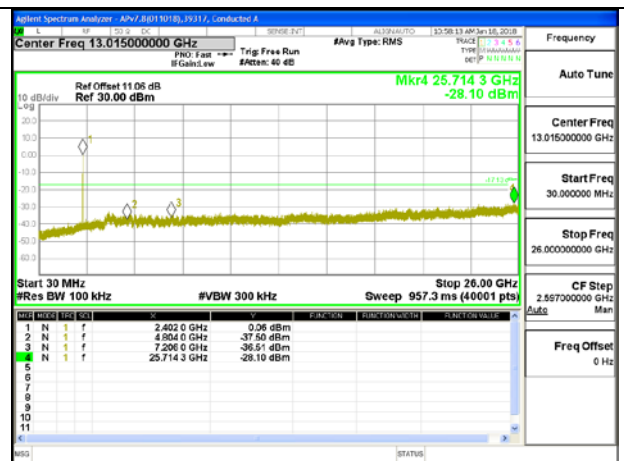
NCC LP0002 3.10.1 §5.1

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

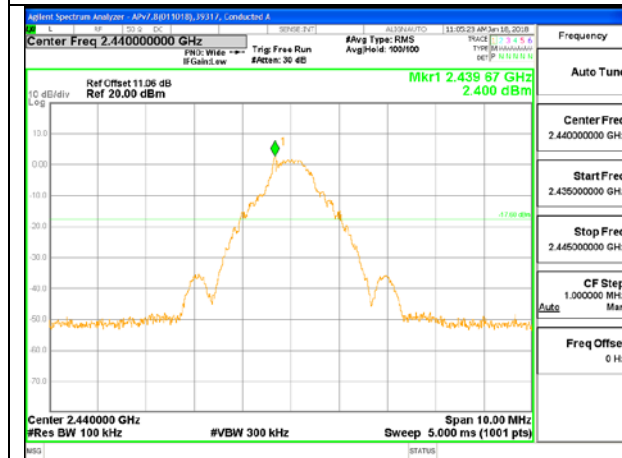
RESULTS



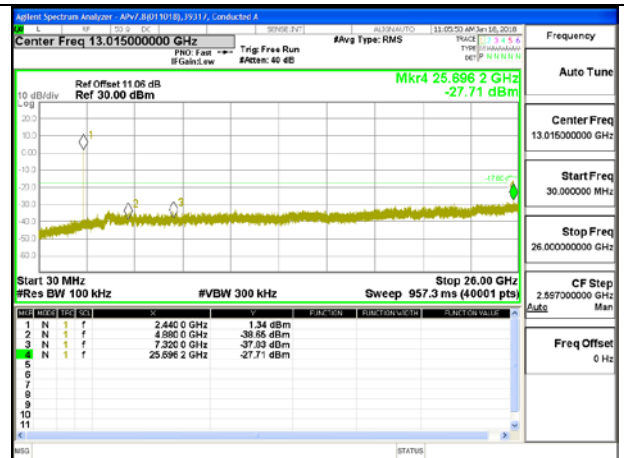
LOW CHANNEL BANDEDGE



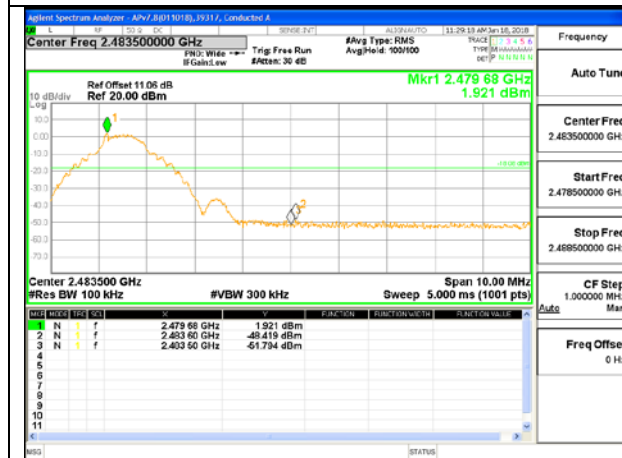
OUT-OF-BAND LOW CHANNEL



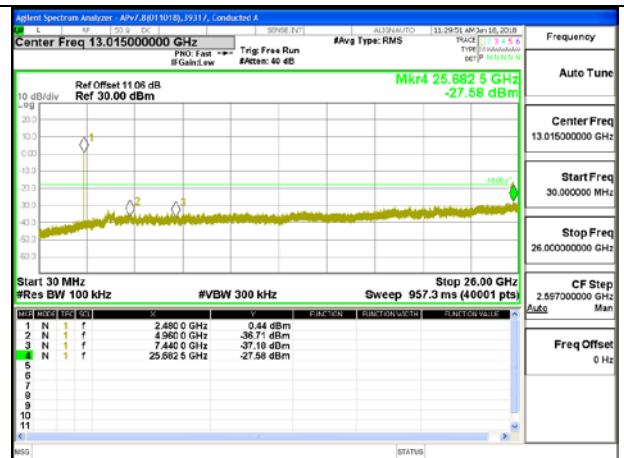
IN-BAND REFERENCE LEVEL



OUT-OF-BAND MID CHANNEL



HIGH CHANNEL BANDEDGE



OUT-OF-BAND HIGH CHANNEL

9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

NCC LP0002 §2.7 and §2.8

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.

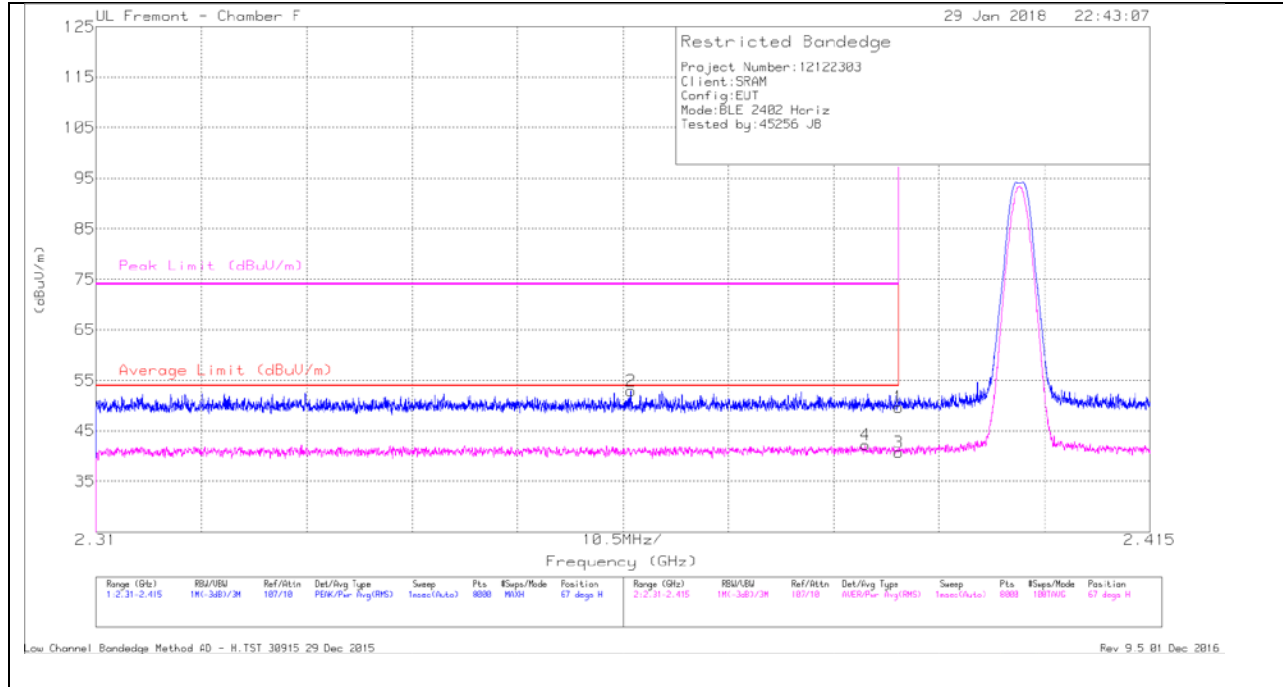
The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

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.

9.2. TRANSMITTER ABOVE 1 GHz

BANDEDGE (LOW CHANNEL)

HORIZONTAL RESULT



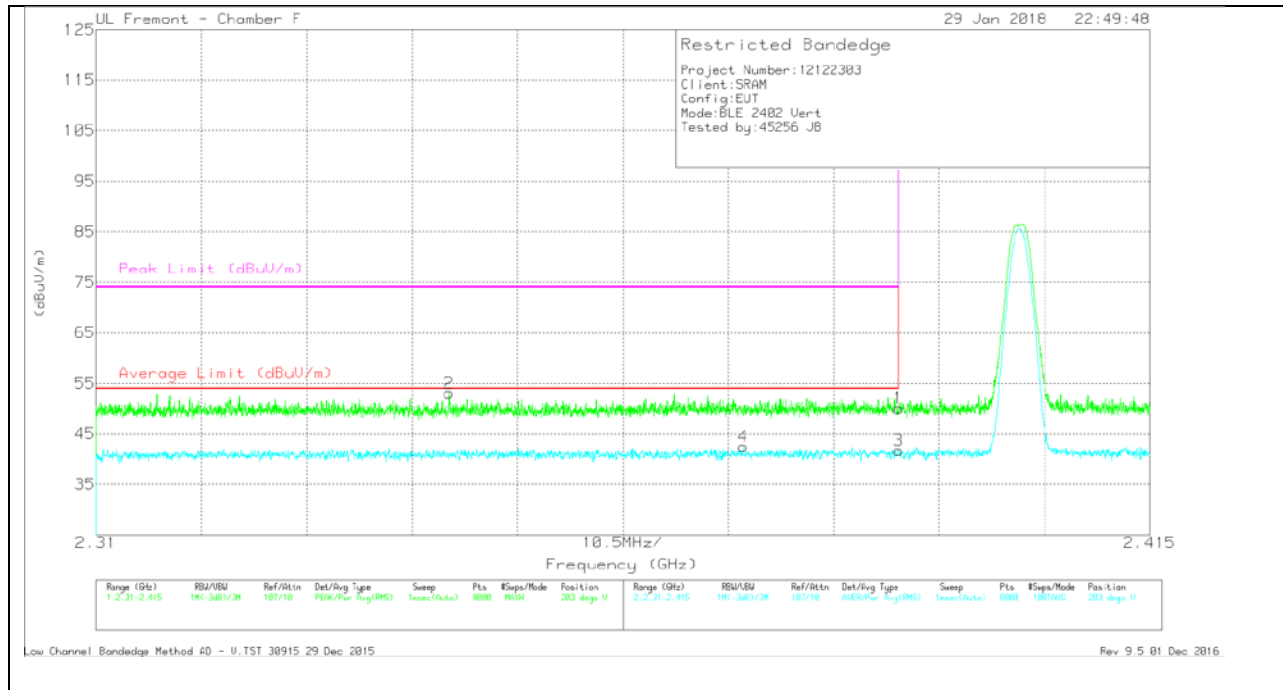
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T119 (dB/m)	Amp/Cbl/Ftr/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.4	Pk	31.9	-20.6	49.7	-	-	74	-24.3	67	176	H
2	* 2.363	41.83	Pk	31.8	-20.7	52.93	-	-	74	-21.07	67	176	H
3	* 2.39	29.42	RMS	31.9	-20.6	40.72	54	-13.28	-	-	67	176	H
4	* 2.387	30.96	RMS	31.9	-20.6	42.26	54	-11.74	-	-	67	176	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	AFT119 (dB/m)	Amp/Cb/Flt/Pa d (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	38.72	Pk	31.9	-20.6	50.02	-	-	74	-23.98	203	108	V
2	* 2.345	42.07	Pk	31.7	-20.7	53.07	-	-	74	-20.93	203	108	V
3	* 2.39	30.43	RMS	31.9	-20.6	41.73	54	-12.27	-	-	203	108	V
4	* 2.375	31.22	RMS	31.8	-20.6	42.42	54	-11.58	-	-	203	108	V

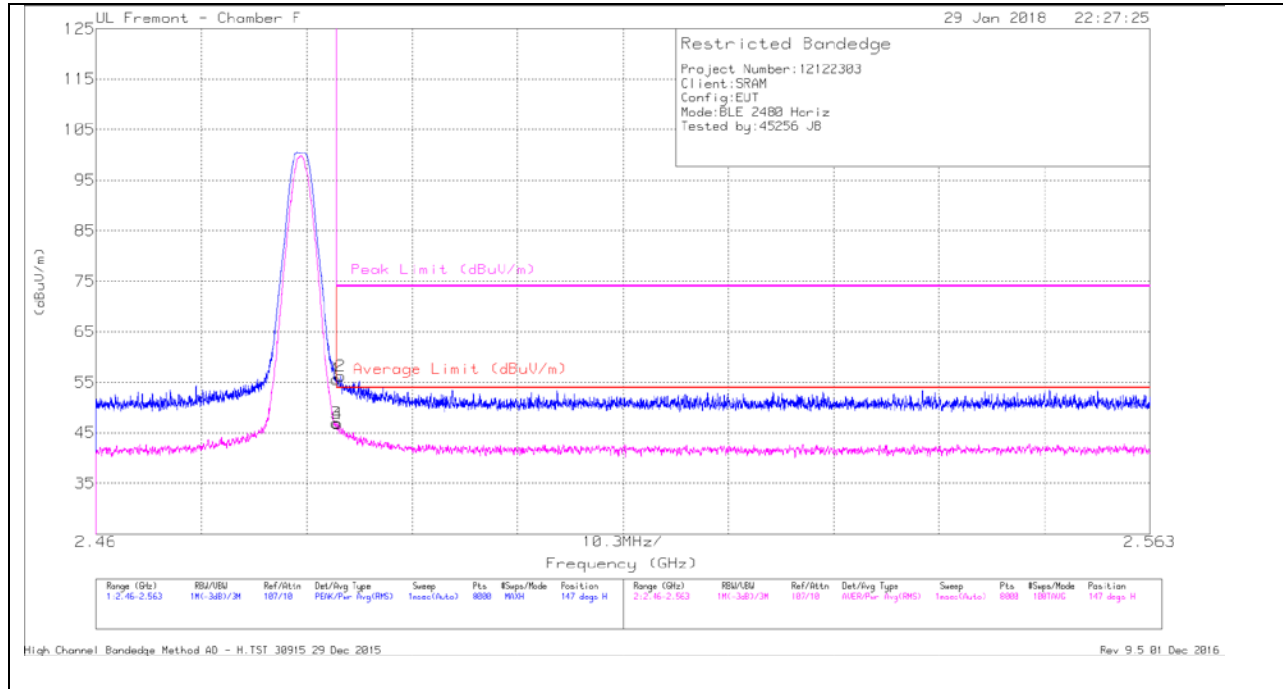
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANEDGE (HIGH CHANNEL)

HORIZONTAL RESULT



Trace Markers

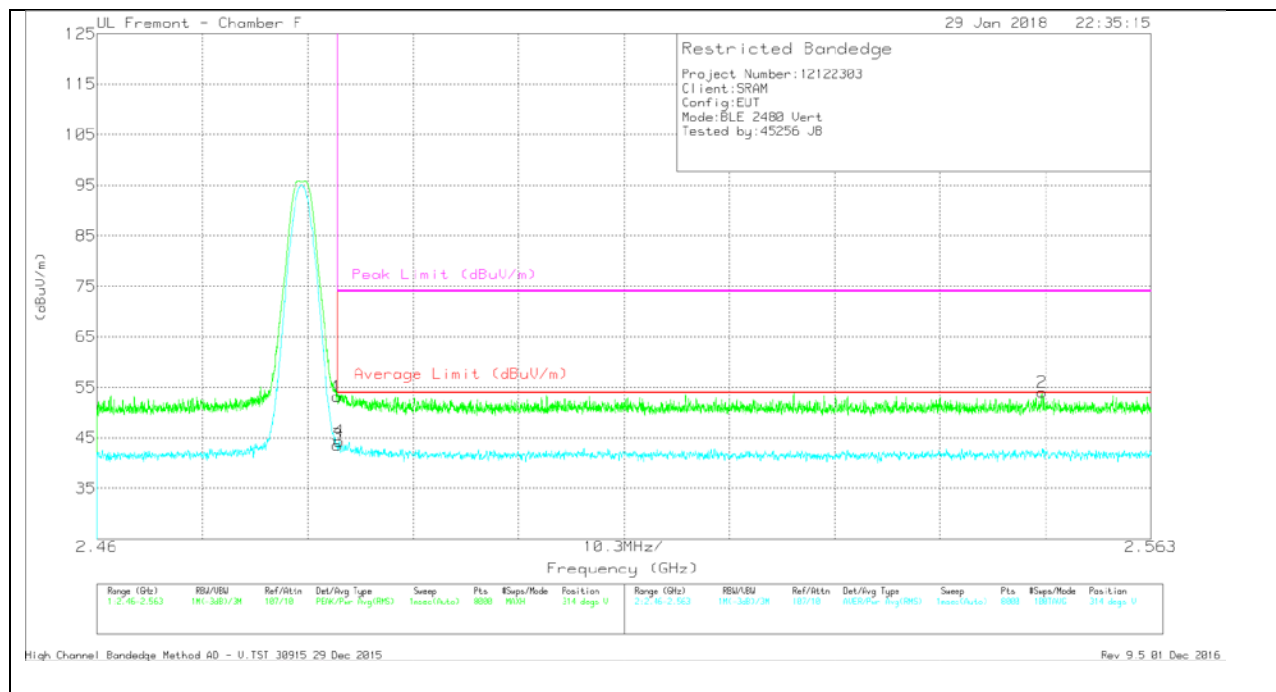
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	Af T119 (dB/m)	Amp/Ch/Filt/Pad (dB)	DC Corr (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	44.27	Pk	32.1	-20.7	0	55.67	-	-	74	-18.33	147	242	H
2	* 2.484	44.8	Pk	32.2	-20.7	0	56.3	-	-	74	-17.7	147	242	H
3	* 2.484	35.5	RMS	32.1	-20.7	0	46.9	54	-7.1	-	-	147	242	H
4	* 2.484	35.38	RMS	32.1	-20.7	0	46.78	54	-7.22	-	-	147	242	H

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

Pk - Peak detector

RMS - RMS detection

VERTICAL RESULT



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AFT119 (dB/m)	Amp/Cb/Fltr/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	41.76	Pk	32.1	-20.7	53.16	-	-	74	-20.84	314	399	V
2	2.552	42.26	Pk	32.2	-20.5	53.96	-	-	74	-20.04	314	399	V
3	* 2.484	32.14	RMS	32.1	-20.7	43.54	54	-10.46	-	-	314	399	V
4	* 2.484	32.95	RMS	32.1	-20.7	44.35	54	-9.65	-	-	314	399	V

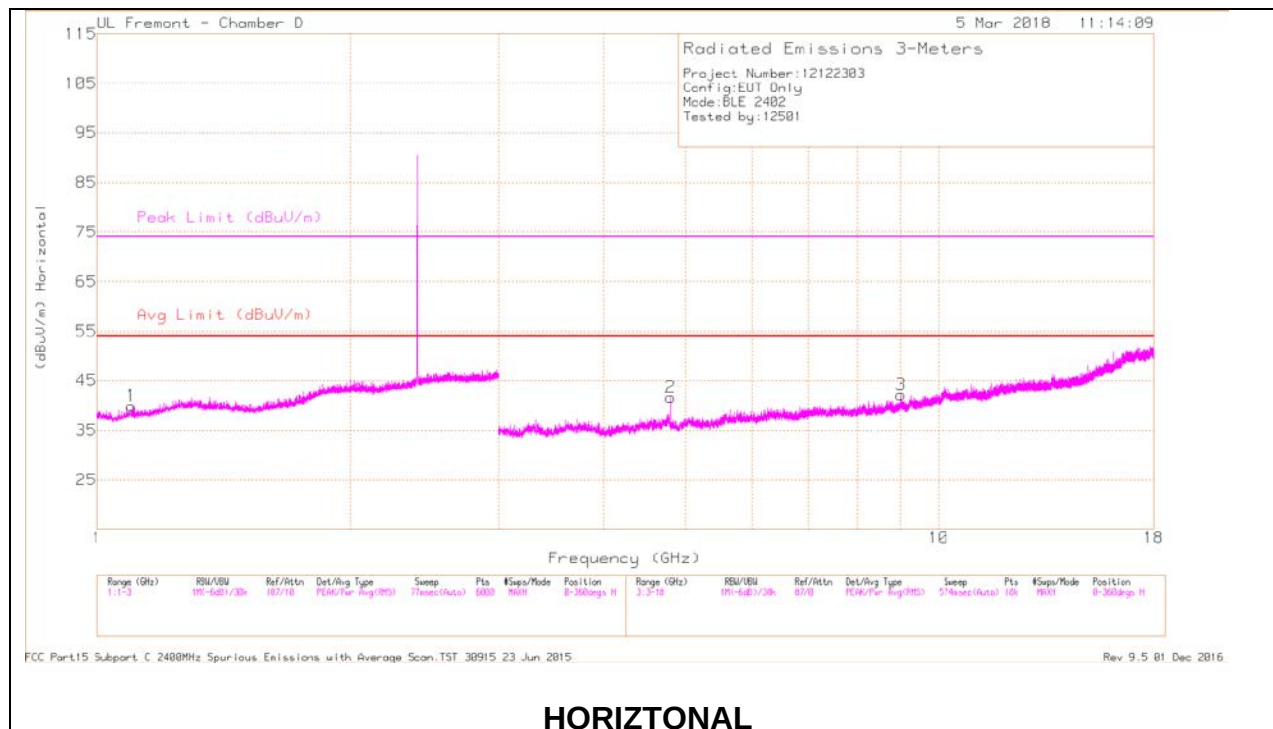
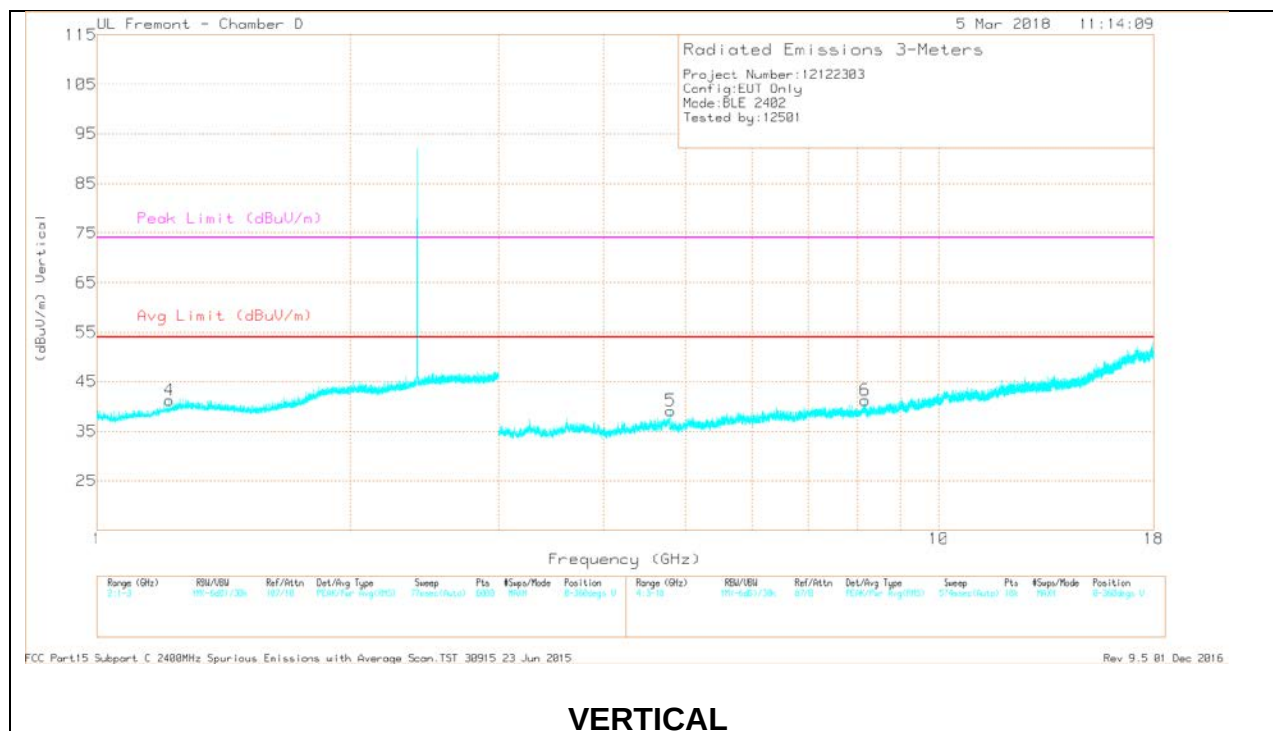
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL RESULTS



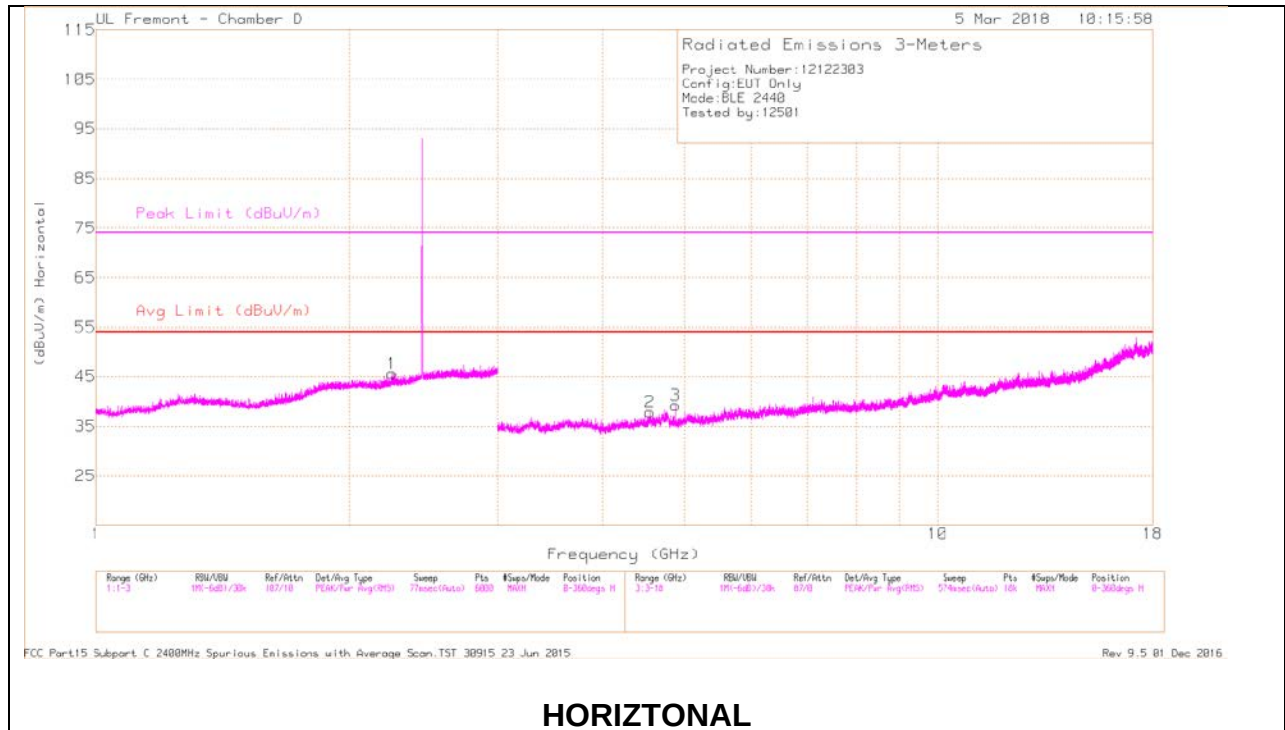
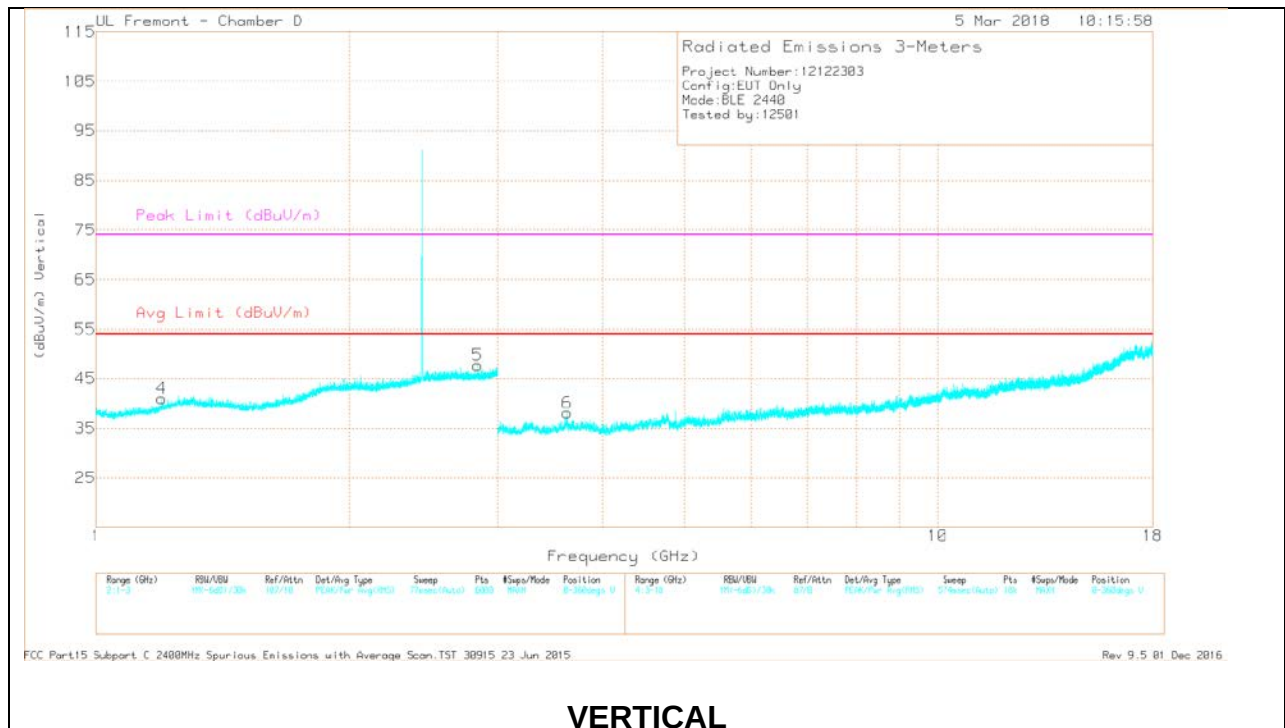
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Ampl/Cbl/Filtr/ Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.098	39.87	PK2	27.4	-22.3	44.97	-	-	74	-29.03	85	144	H
	* 1.097	28.4	MAv1	27.4	-22.3	33.5	54	-20.5	-	-	85	144	H
4	* 1.22	40.78	PK2	28.6	-22.1	47.28	-	-	74	-26.72	296	104	V
	* 1.22	28.31	MAv1	28.6	-22.2	34.71	54	-19.29	-	-	296	104	V
2	* 4.805	35.46	PK2	34.5	-26.5	43.46	-	-	74	-30.54	23	295	H
	* 4.805	23.68	MAv1	34.5	-26.5	31.68	54	-22.32	-	-	23	295	H
3	* 9.012	32.18	PK2	36.2	-21.3	47.08	-	-	74	-26.92	356	159	H
	* 9.01	20.75	MAv1	36.2	-21.4	35.55	54	-18.45	-	-	356	159	H
5	* 4.804	35.52	PK2	34.5	-26.5	43.52	-	-	74	-30.48	212	359	V
	* 4.804	23.57	MAv1	34.5	-26.5	31.57	54	-22.43	-	-	212	359	V
6	* 8.167	33.22	PK2	35.8	-22.5	46.52	-	-	74	-27.48	140	356	V
	* 8.168	21.54	MAv1	35.8	-22.5	34.84	54	-19.16	-	-	140	356	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL RESULTS



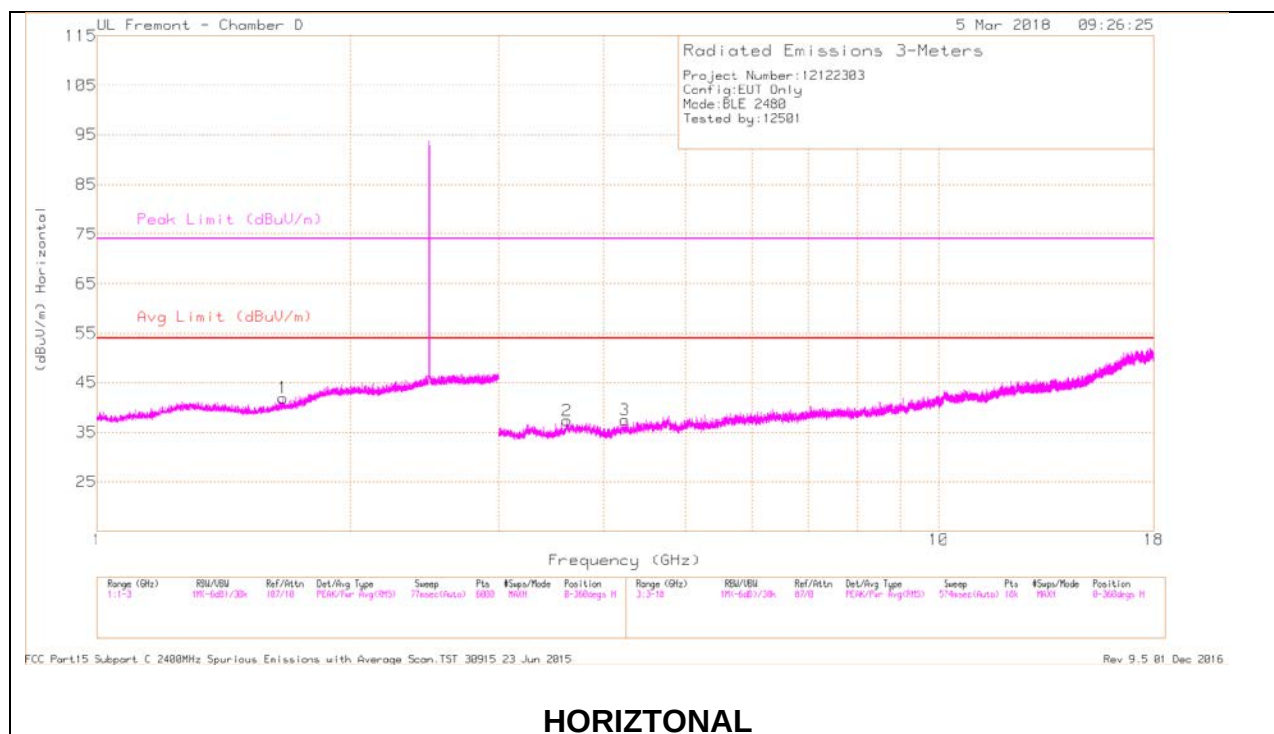
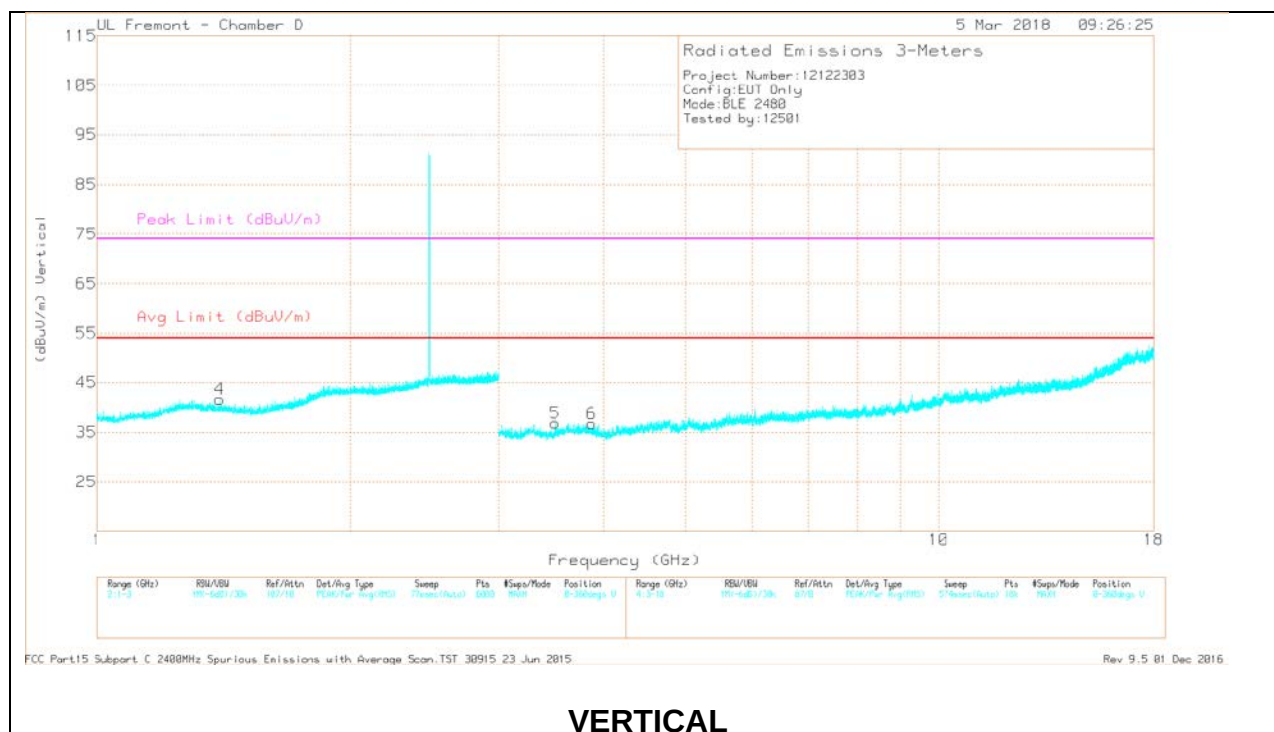
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cbl/Filtr/ Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.248	39.88	PK2	31.5	-20.7	50.68	-	-	74	-23.32	41	384	H
	* 2.248	28.2	MAv1	31.5	-20.7	39	54	-15	-	-	41	384	H
4	* 1.193	40.11	PK2	28.2	-22.1	46.21	-	-	74	-27.79	8	390	V
	* 1.196	28.41	MAv1	28.2	-22.1	34.51	54	-19.49	-	-	8	390	V
5	* 2.84	39.66	PK2	32.6	-20	52.26	-	-	74	-21.74	251	145	V
	* 2.839	27.87	MAv1	32.6	-20	40.47	54	-13.53	-	-	251	145	V
2	* 4.551	36.47	PK2	34.6	-27.5	43.57	-	-	74	-30.43	4	124	H
	* 4.549	24.65	MAv1	34.6	-27.6	31.65	54	-22.35	-	-	4	124	H
3	* 4.88	36.26	PK2	34.4	-27.7	42.96	-	-	74	-31.04	158	392	H
	* 4.88	23.99	MAv1	34.4	-27.7	30.69	54	-23.31	-	-	158	392	H
6	* 3.626	36.65	PK2	33.6	-28.3	41.95	-	-	74	-32.05	32	127	V
	* 3.628	24.87	MAv1	33.6	-28.4	30.07	54	-23.93	-	-	32	127	V

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

PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

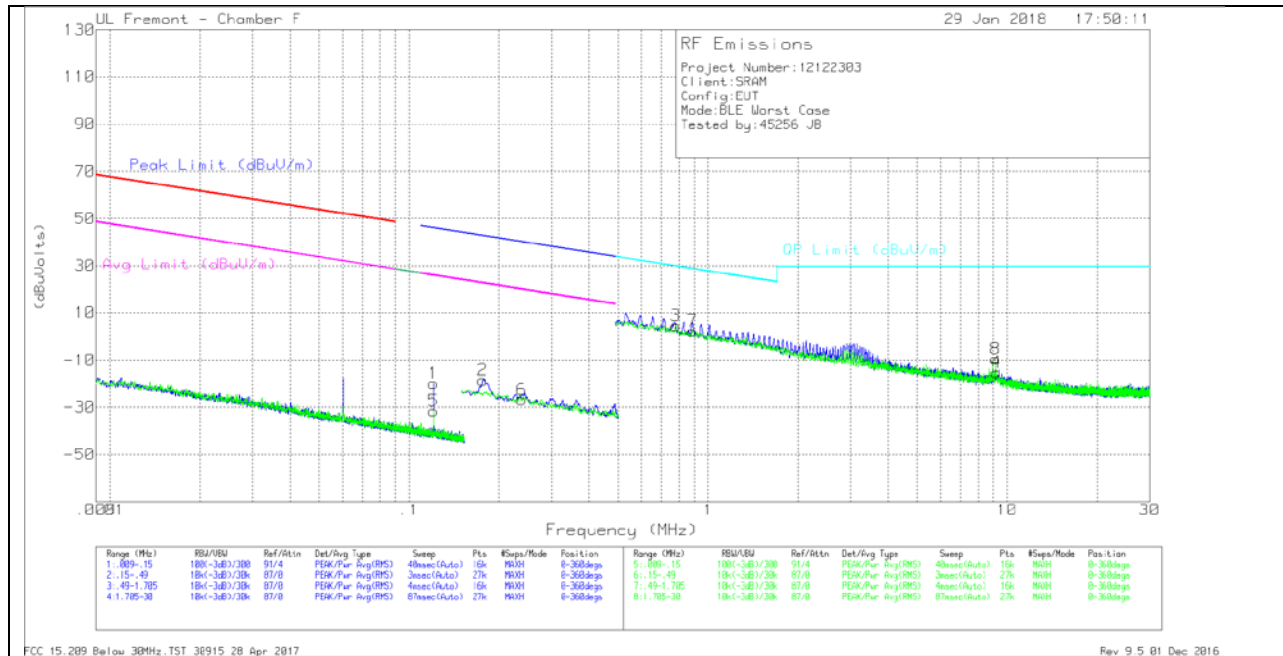
HIGH CHANNEL RESULTS



Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T136 (dB/m)	Amp/Cb/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	* 1.663	40.23	PK2	28.9	-21.5	47.63	-	-	74	-26.37	101	359	H
	* 1.665	28.16	MAv1	28.9	-21.5	35.56	54	-18.44	-	-	101	359	H
4	* 1.4	40.24	PK2	28.8	-21.9	47.14	-	-	74	-26.86	207	376	V
	* 1.397	28.07	MAv1	28.8	-21.9	34.97	54	-19.03	-	-	207	376	V
2	* 3.622	36.35	PK2	33.6	-28.2	41.75	-	-	74	-32.25	187	311	H
	* 3.619	24.77	MAv1	33.6	-28.1	30.27	54	-23.73	-	-	187	311	H
3	* 4.238	35.23	PK2	33.8	-27	42.03	-	-	74	-31.97	28	207	H
	* 4.239	23.93	MAv1	33.8	-27	30.73	54	-23.27	-	-	28	207	H
5	* 3.504	37.82	PK2	33.2	-28.2	42.82	-	-	74	-31.18	54	349	V
	* 3.503	25.38	MAv1	33.2	-28.3	30.28	54	-23.72	-	-	54	349	V
6	* 3.871	36.94	PK2	33.6	-28.2	42.34	-	-	74	-31.66	355	377	V
	* 3.871	25.12	MAv1	33.6	-28.2	30.52	54	-23.48	-	-	355	377	V

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

9.3. Worst Case Below 30MHz



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

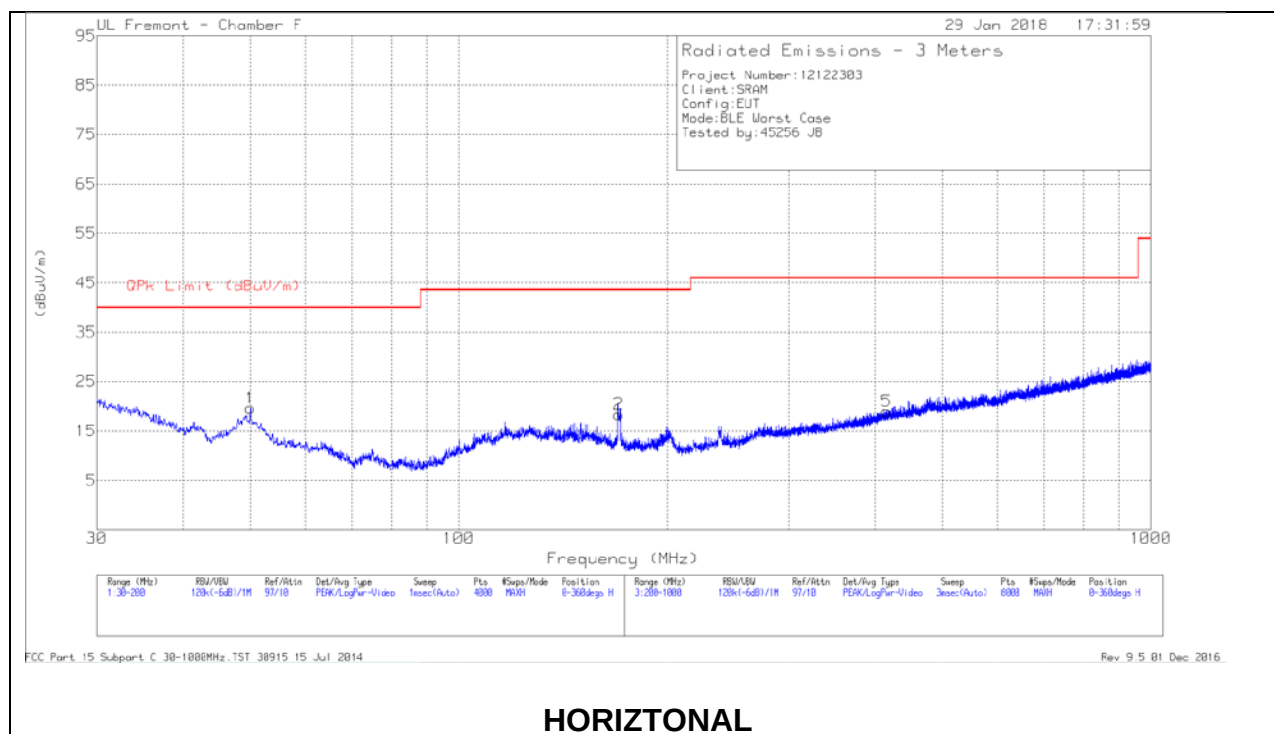
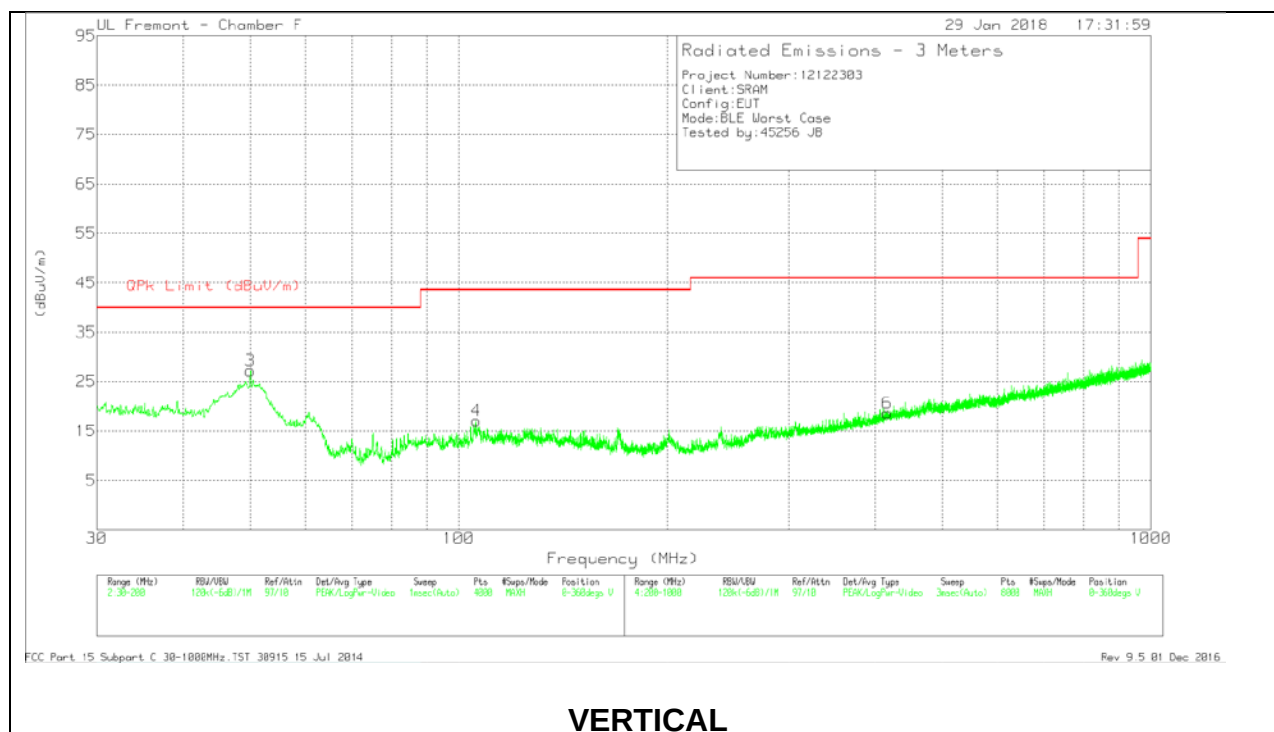
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.12088	48.5	Pk	11.7	0	-80	-19.8	45.98	-65.78	25.98	-45.78	0-360
2	.17696	49.74	Pk	11.6	.1	-80	-18.56	42.66	-61.22	22.66	-41.22	0-360
5	.12091	36.82	Pk	11.7	0	-80	-31.48	45.98	-77.46	25.98	-57.46	0-360
6	.23857	41.65	Pk	11.5	.1	-80	-26.75	40.06	-66.81	20.06	-46.81	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.78024	33.01	Pk	11.5	.1	-40	4.61	29.77	-25.16	0-360
4	9.21392	13.53	Pk	10.9	.4	-40	-15.17	29.5	-44.67	0-360
7	.88873	30.77	Pk	11.5	.1	-40	2.37	28.64	-26.27	0-360
8	9.16309	19.21	Pk	10.9	.4	-40	-9.49	29.5	-38.99	0-360

Pk - Peak detector

9.4. Worst Case Below 1 GHz



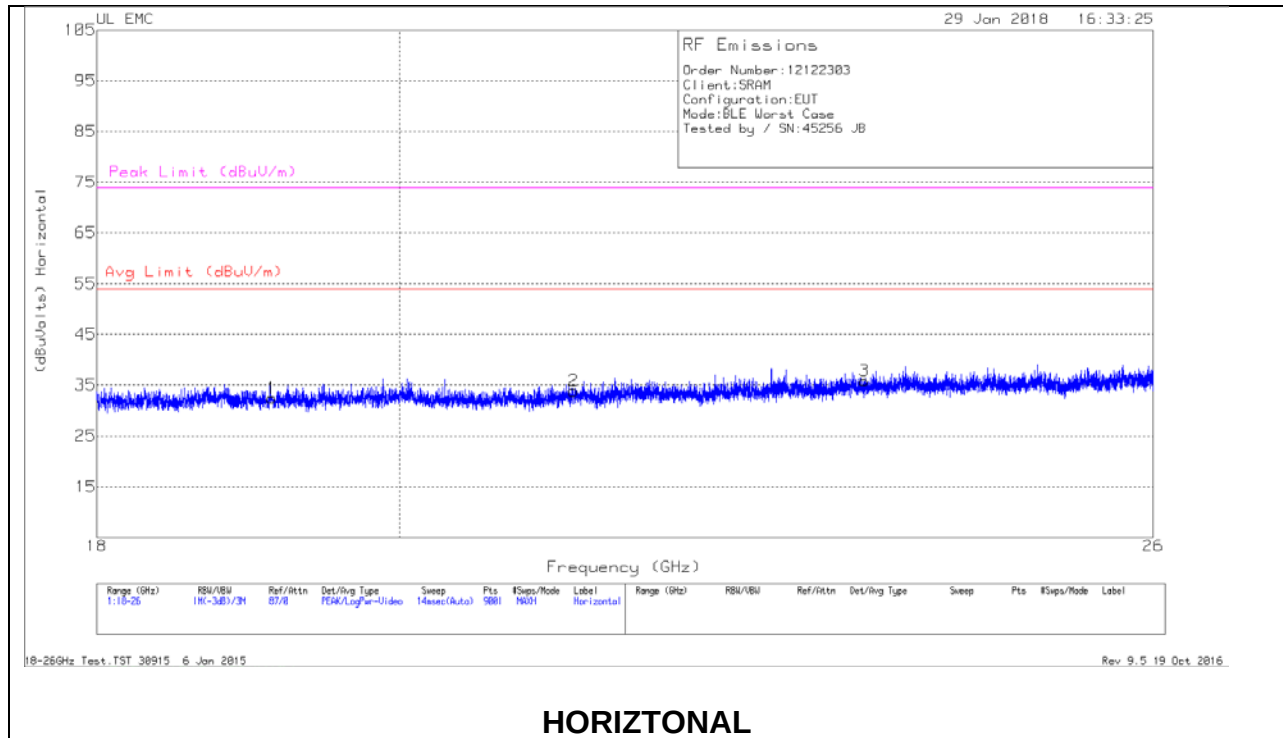
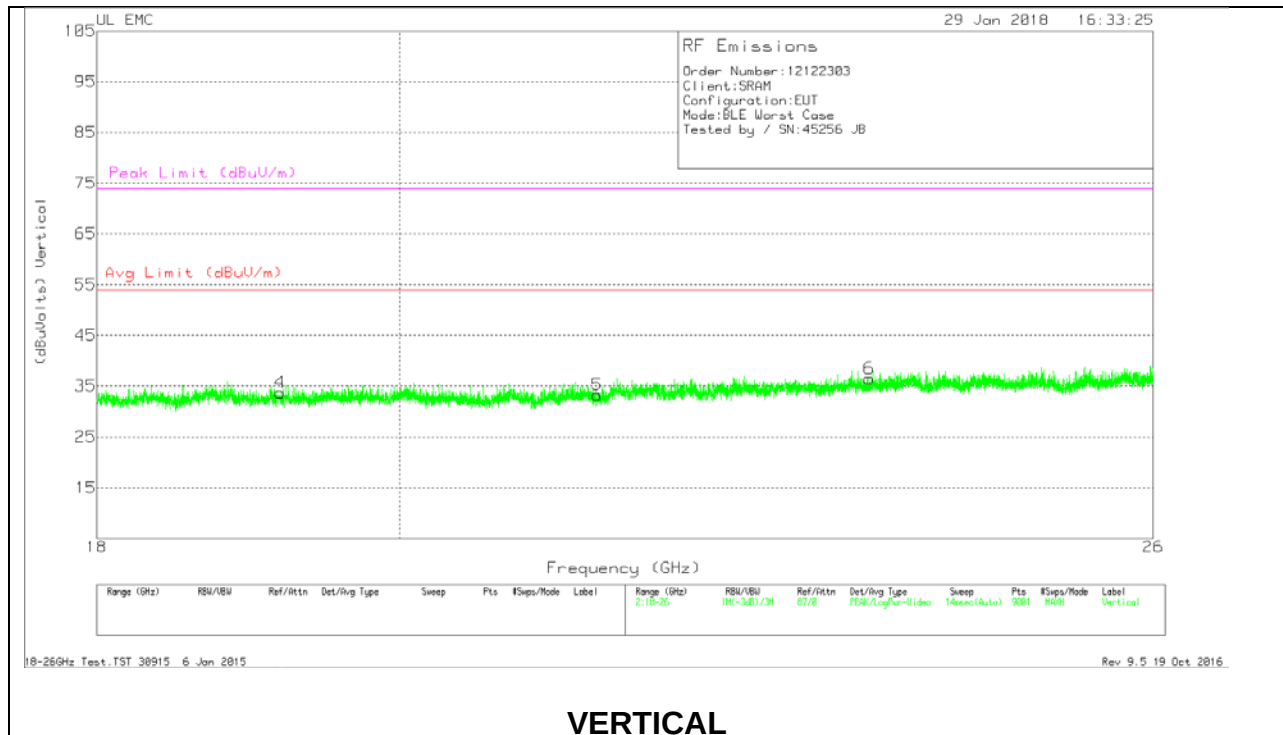
Below 1GHz Data

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T408 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	49.9802	39.64	Pk	11.7	-31.7	19.64	40	-20.36	0-360	199	H
2	* 170.1588	33.34	Pk	15.7	-30.7	18.34	43.52	-25.18	0-360	101	H
3	49.9802	47.19	Pk	11.7	-31.7	27.19	40	-12.81	0-360	100	V
4	105.9246	32.64	Pk	15.6	-31.2	17.04	43.52	-26.48	0-360	100	V
5	415.328	28.28	Pk	20.2	-29.5	18.98	46.02	-27.04	0-360	101	H
6	415.628	27.96	Pk	20.2	-29.5	18.66	46.02	-27.36	0-360	199	V

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

Pk - Peak detector

9.5. Worst Case 18-26 GHz



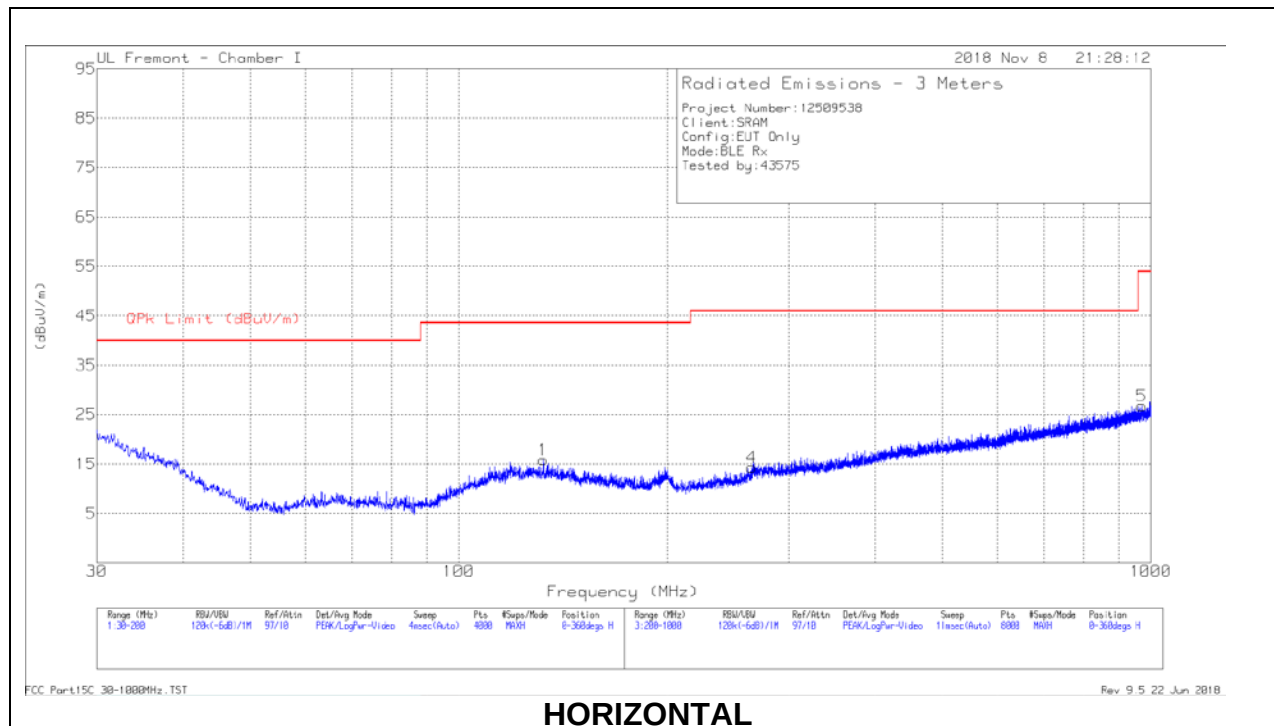
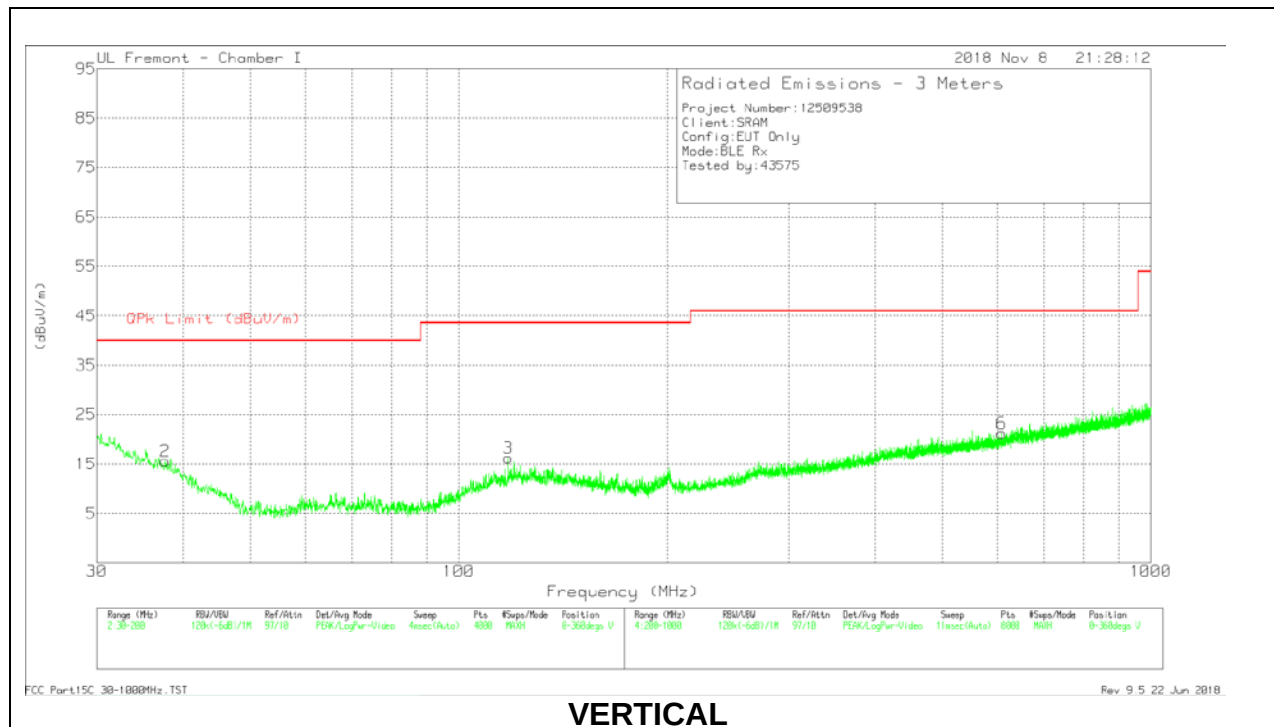
18 – 26GHz DATA

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	19.132	34.29	Pk	32.2	-24.5	-9.5	32.49	54	-21.51	74	-41.51
2	21.248	35.57	Pk	33.2	-25.4	-9.5	33.87	54	-20.13	74	-40.13
3	23.513	36.88	Pk	33.2	-24.7	-9.5	35.88	54	-18.12	74	-38.12
4	19.186	35.66	Pk	32.3	-24.7	-9.5	33.76	54	-20.24	74	-40.24
5	21.426	35.4	Pk	33.1	-25.7	-9.5	33.3	54	-20.7	74	-40.7
6	23.553	37.41	Pk	33.3	-24.7	-9.5	36.51	54	-17.49	74	-37.49

Pk - Peak detector

9.1. RECEIVER WORST-CASE BELOW 1GHz

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



DATA

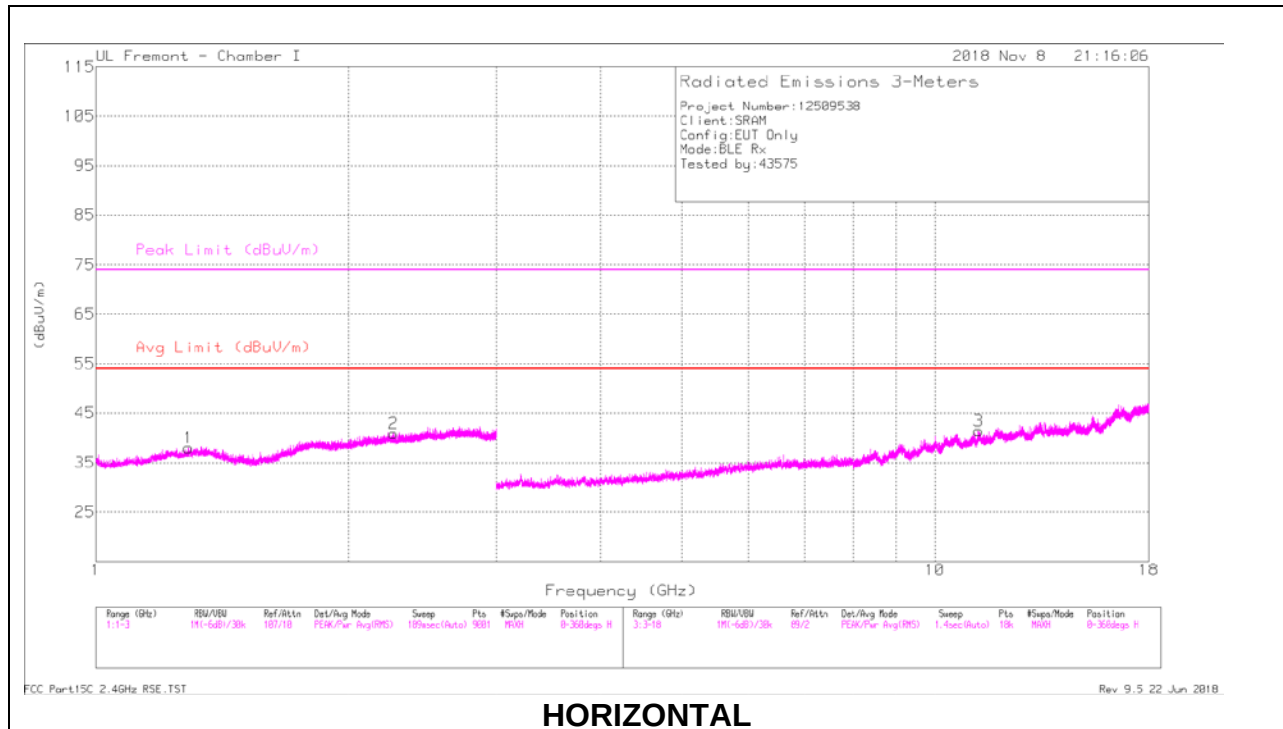
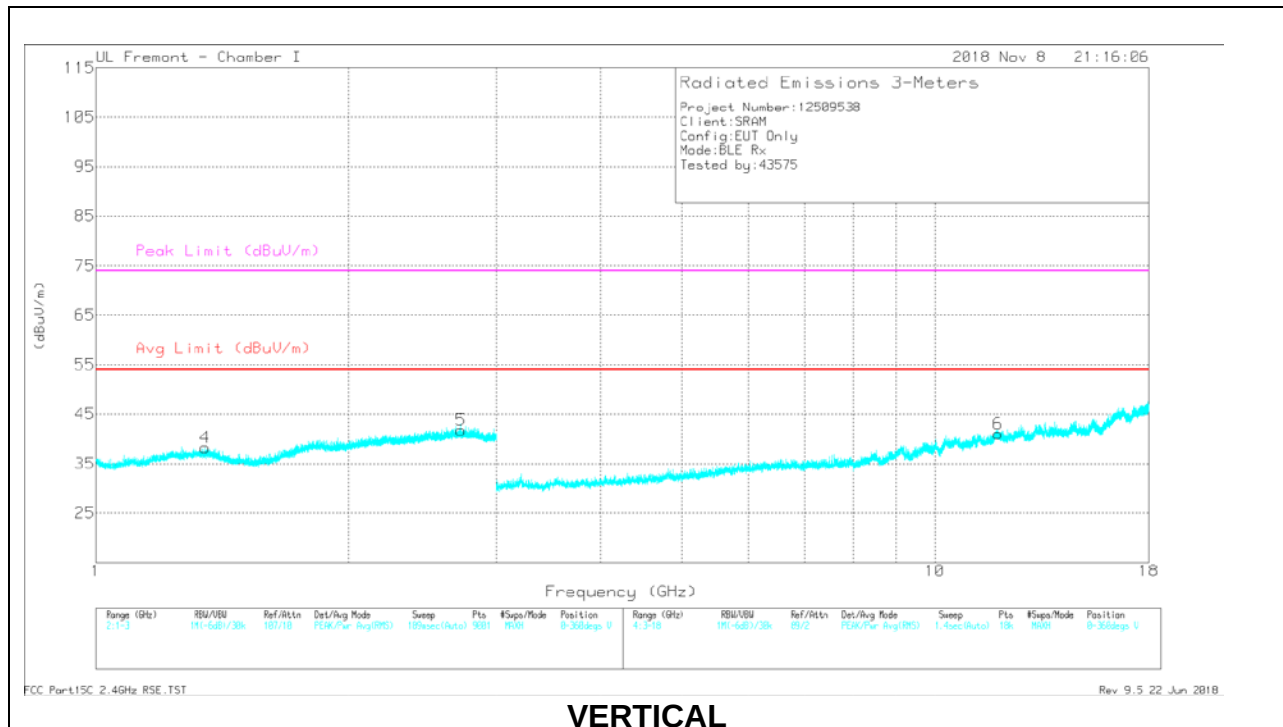
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T900 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 132.6216	28.67	Pk	17.7	-30.6	15.77	43.52	-27.75	0-360	299	H
2	* 37.6095	26.81	Pk	20.1	-31.3	15.61	40	-24.39	0-360	101	V
3	* 117.9127	29.25	Pk	17.5	-30.6	16.15	43.52	-27.37	0-360	101	V
4	* 265.4085	27.41	Pk	16.8	-29.9	14.31	46.02	-31.71	0-360	199	H
5	* 971.5003	26.36	Pk	26.9	-26.5	26.76	53.97	-27.21	0-360	101	H
6	* 609.4532	27.62	Pk	22.7	-29.1	21.22	46.02	-24.8	0-360	199	V

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

Pk - Peak detector

9.2. RECEIVER Worst Case 1-18 GHz

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



DATA

Trace Markers

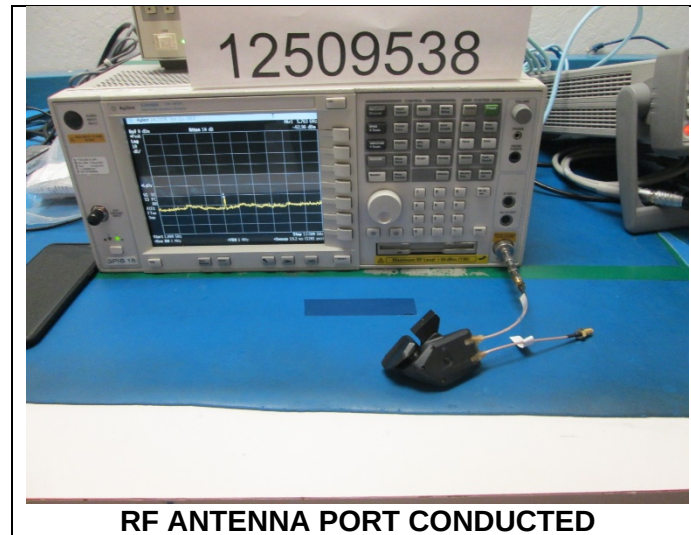
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 1.289	31.84	Pk	29.2	-23	38.04	-	-	74	-35.96	0-360	199	H
2	* 2.265	31.11	Pk	31.4	-21.6	40.91	-	-	74	-33.09	0-360	98	H
4	* 1.351	32.06	Pk	29.4	-23.2	38.26	-	-	74	-35.74	0-360	102	V
5	* 2.726	30.41	Pk	32.4	-21	41.81	-	-	74	-32.19	0-360	199	V
3	* 11.28	23.87	Pk	38	-20.4	41.47	-	-	74	-32.53	0-360	199	H
6	* 11.897	23.35	Pk	38.7	-21	41.05	-	-	74	-32.95	0-360	102	V

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

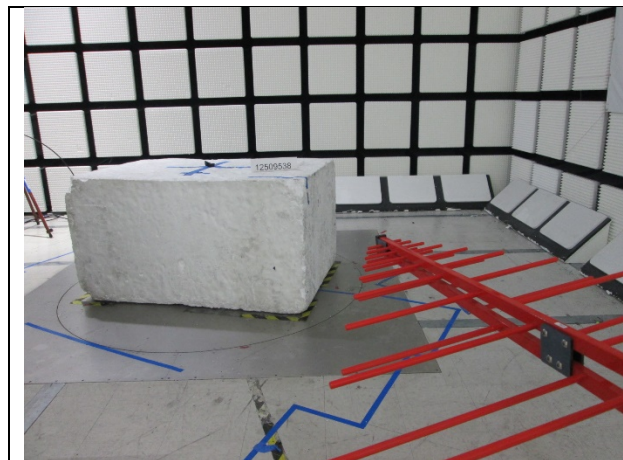
Pk - Peak detector

10. SETUP PHOTOS

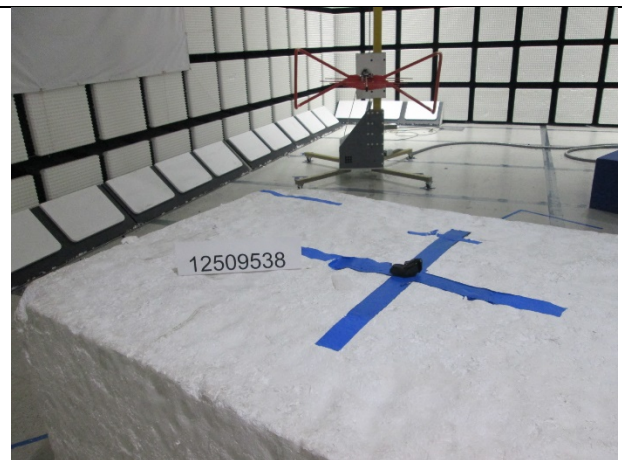
ANTENNA PORT SETUP



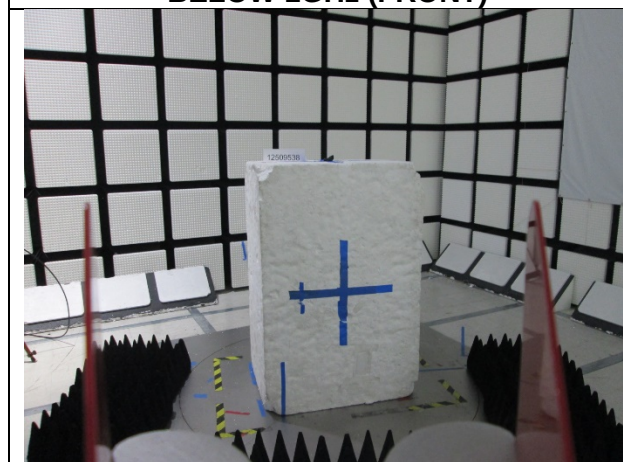
RADIATED RF MEASUREMENT SETUP



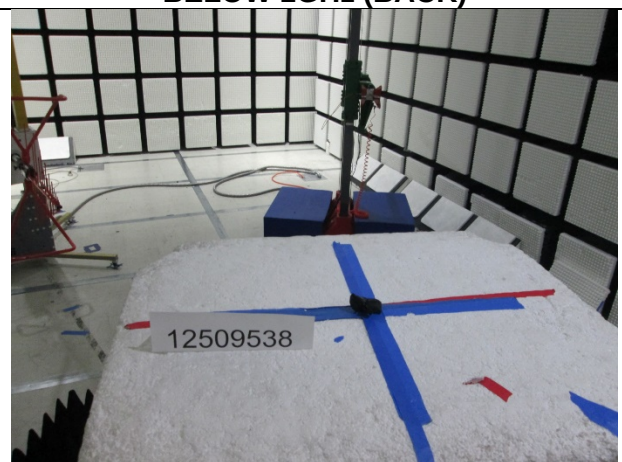
BELOW 1GHz (FRONT)



BELOW 1GHz (BACK)



ABOVE 1GHz (FRONT)



ABOVE 1GHz (BACK)



BELOW 30MHz (FRONT)



BELOW 30MHz (BACK)

ORIENTATIONS



X-ORIENTATION



Y-ORIENTATION



Z-ORIENTATION

END OF REPORT