



CERTIFICATION TEST REPORT

Report Number. : 12509320-E2V2

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

Model : 12920

FCC ID : C9O-RDMB1

IC : 10161A-RDMB1

EUT Description : Rear Derailleur with BLE, AIREA and ANT+ Radios

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

Date Of Issue:
November 05, 2018

Prepared by:
UL Verification Services Inc.
47173 Benicia Street
Fremont, CA 94538 U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888



REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	10/5/2018	Initial Issue	
V2	11/5/2018	Added channel 25 data	Glenn Escano

TABLE OF CONTENTS

REPORT REVISION HISTORY	2
TABLE OF CONTENTS	3
1. ATTESTATION OF TEST RESULTS	5
2. TEST METHODOLOGY	6
3. FACILITIES AND ACCREDITATION	6
4. CALIBRATION AND UNCERTAINTY	7
4.1. MEASURING INSTRUMENT CALIBRATION	7
4.2. SAMPLE CALCULATION	7
4.3. MEASUREMENT UNCERTAINTY.....	7
5. EQUIPMENT UNDER TEST	8
5.1. EUT DESCRIPTION	8
5.2. MAXIMUM OUTPUT POWER.....	8
5.3. DESCRIPTION OF AVAILABLE ANTENNAS	8
5.4. SOFTWARE AND FIRMWARE.....	8
5.5. WORST-CASE CONFIGURATION AND MODE	8
5.6. DESCRIPTION OF TEST SETUP.....	9
6. MEASUREMENT METHOD.....	12
7. TEST AND MEASUREMENT EQUIPMENT	13
8. ANTENNA PORT TEST RESULTS	14
8.1. ON TIME AND DUTY CYCLE.....	14
8.2. 99% BANDWIDTH.....	16
8.3. 6 dB BANDWIDTH.....	17
8.4. OUTPUT POWER.....	18
8.5. AVERAGE POWER	19
8.6. POWER SPECTRAL DENSITY	20
8.7. CONDUCTED SPURIOUS EMISSIONS.....	21
9. RADIATED TEST RESULTS.....	23
9.1. LIMITS AND PROCEDURE	23
9.2. TRANSMITTER ABOVE 1 GHz	24
9.3. Worst Case Below 30MHz	38
9.4. Worst Case Below 1 GHz	39

9.5.	Worst Case 18-26 GHz.....	41
10.	SETUP PHOTOS	43

1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: Rear Derailleur with BLE, AIREA and ANT+ Radios

MODEL: 12920

SERIAL NUMBER: Conducted: 1414020017, 1414020025
Radiated: 1314020025, 1314020053

DATE TESTED: SEPTEMBER 21 – OCTOBER 29, 2018

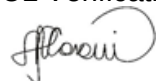
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
ISED RSS-247 Issue 2	Complies
ISED RSS-GEN Issue 5	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:



Dan Corona
Operations Leader
Consumer Technology Division
UL Verification Services Inc.

Reviewed By:



Steven Tran
Project Engineer
Consumer Technology Division
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, ANSI C63.10-2013, KDB 558074 D01 15.247 Meas Guidance v05, 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 (ISED:2324B-1)	☐ Chamber D (ISED:22541-1)	☒ Chamber I (ISED:2324A-5)
☐ Chamber B (ISED:2324B-2)	☐ Chamber E (ISED:22541-2)	☐ Chamber J (ISED:2324A-6)
☐ Chamber C (ISED:2324B-3)	☐ Chamber F (ISED:22541-3)	☐ Chamber K (ISED:2324A-1)
	☐ Chamber G (ISED:22541-4)	☐ Chamber L (ISED:2324A-3)
	☐ Chamber H (ISED: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

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.

36.5 dBuV + 0 dB + 10.1 dB + 0 dB = 46.6 dBuV

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. EUT DESCRIPTION

The EUT is a Rear Derailleur with BLE, AIREA and ANT+ Radios.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2405 - 2480	AIREA	3.97	2.49

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a chip antenna with a maximum gain of 0 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, above 18GHz, and power line conducted emission 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

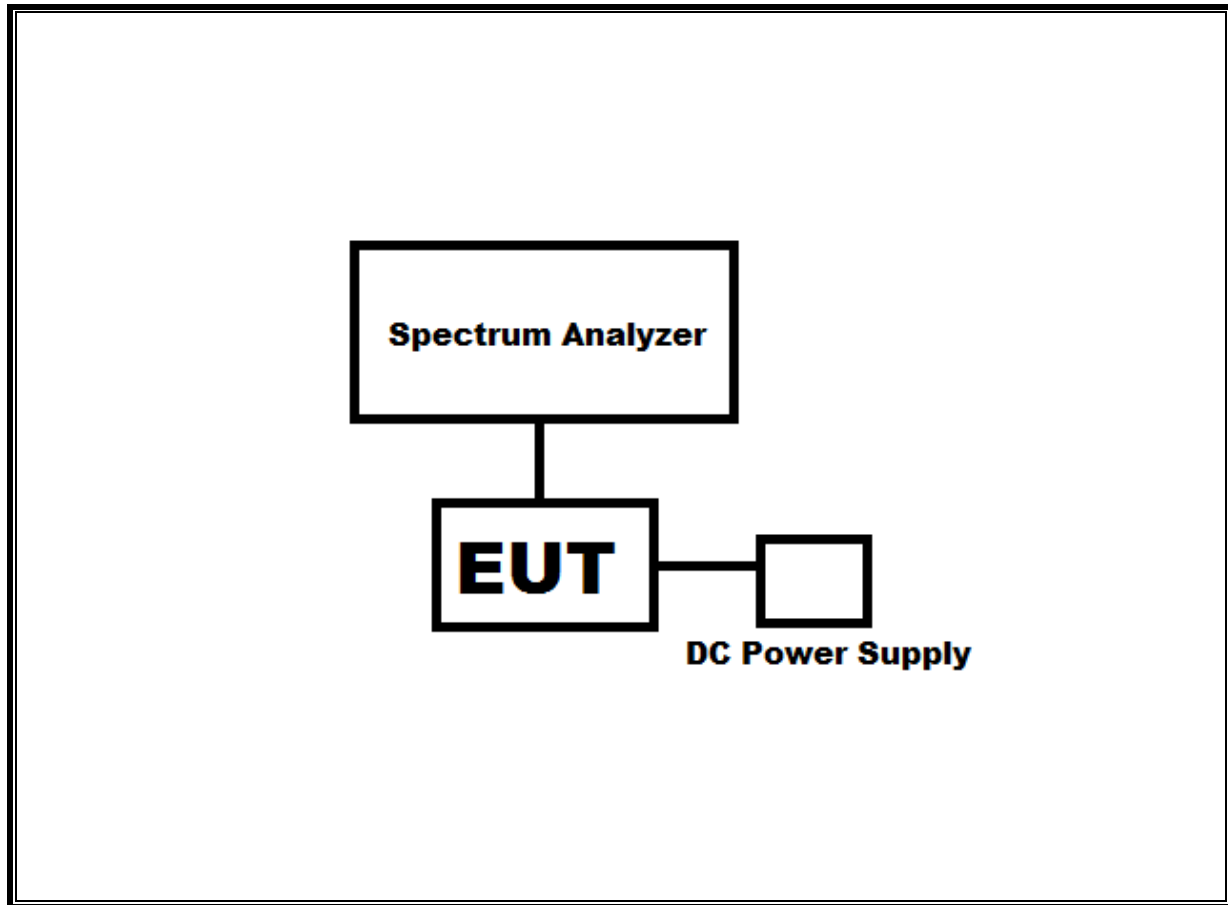
SUPPORT EQUIPMENT

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

TEST SETUP

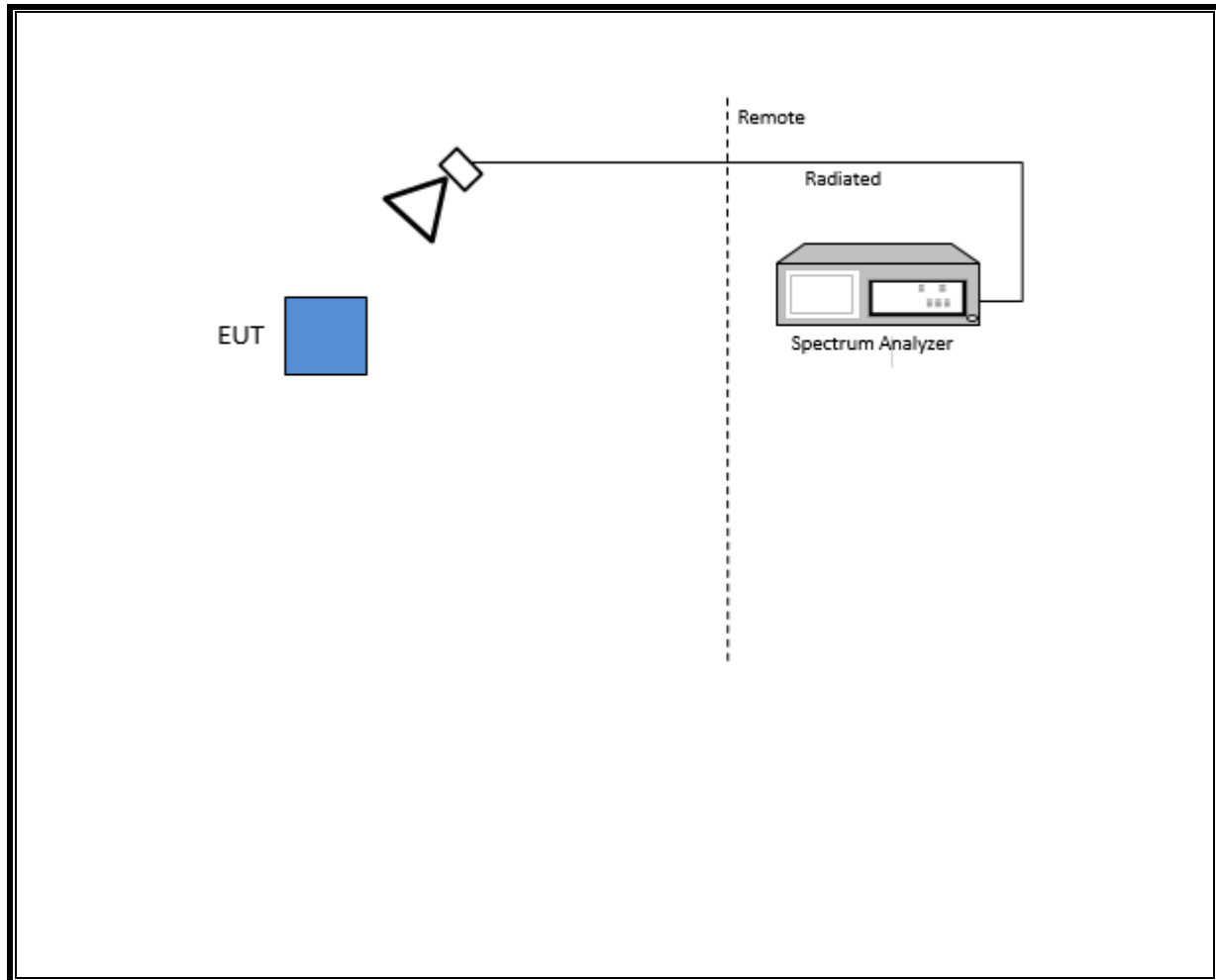
The EUT is powered by 7.4v, 2.2wh Li-Ion battery. The iPod Touch wirelessly sends commands to the EUT.

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 battery pack

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 Number	Cal Due	Last Cal
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences Corp.	JB1	T130	10/16/2018	10/16/2017
Antenna, Horn 1-18GHz	ETS-Lindgren	3117	T345	04/25/2019	04/25/2018
Antenna, Horn, 1-18GHz	ETS Lindgren	3117	T862	05/24/18	05/24/19
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T1165	11/25/2018	11/25/2017
RF Preamplifier, 1 - 18GHz	MITEQ	AFS42-00101800-25-S-42	171460	08/01/18	08/01/19
Antenna, Active Loop 9kHz – 30MHz	Com-Power	AL-130R	T1866	10/10/2018	10/10/2017
Antenna, Horn, 18-26GHz	ARA	MWH-1826G	T89	01/18/2019	01/18/2018
Spectrum Analyzer	Keysight	N9030A	T1113	12/21/2018	12/21/2017
RF Preamplifier, 1-26GHz	Agilent	8449B	T404	03/09/2019	03/29/2018
Power Meter, P-series single channel	Agilent (Keysight) Technologies	N1911A	T1271	07/17/2019	07/17/2018
Power Sensor, P-series, 50MHz to 18GHz, Wideband	Agilent (Keysight) Technologies	N1921A	T1225	04/10/2019	04/10/2018
Spectrum Analyzer	Agilent (Keysight) Technologies	N9030A	T146	08/13/2019	08/13/2018
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1466	04/16/2019	04/16/2018

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. 8.8.1, Sep. 26, 2018

8. ANTENNA PORT TEST RESULTS

8.1. ON TIME AND DUTY CYCLE

LIMITS

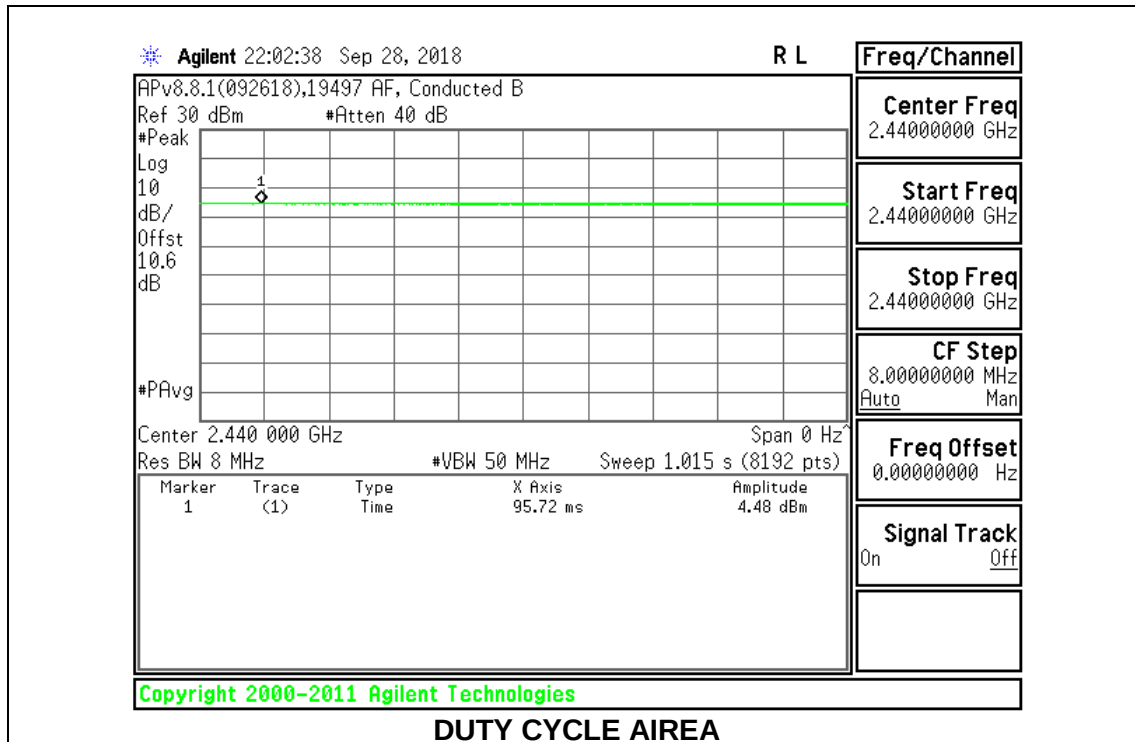
None; for reporting purposes only.

PROCEDURE

ON TIME AND DUTY CYCLE RESULTS

Mode	ON Time B (msec)	Period (msec)	Duty Cycle x (linear)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	1/B Minimum VBW (kHz)
2.4GHz Band						
AIREA	1.000	1.000	1.000	100.00%	0.00	0.010

DUTY CYCLE PLOTS



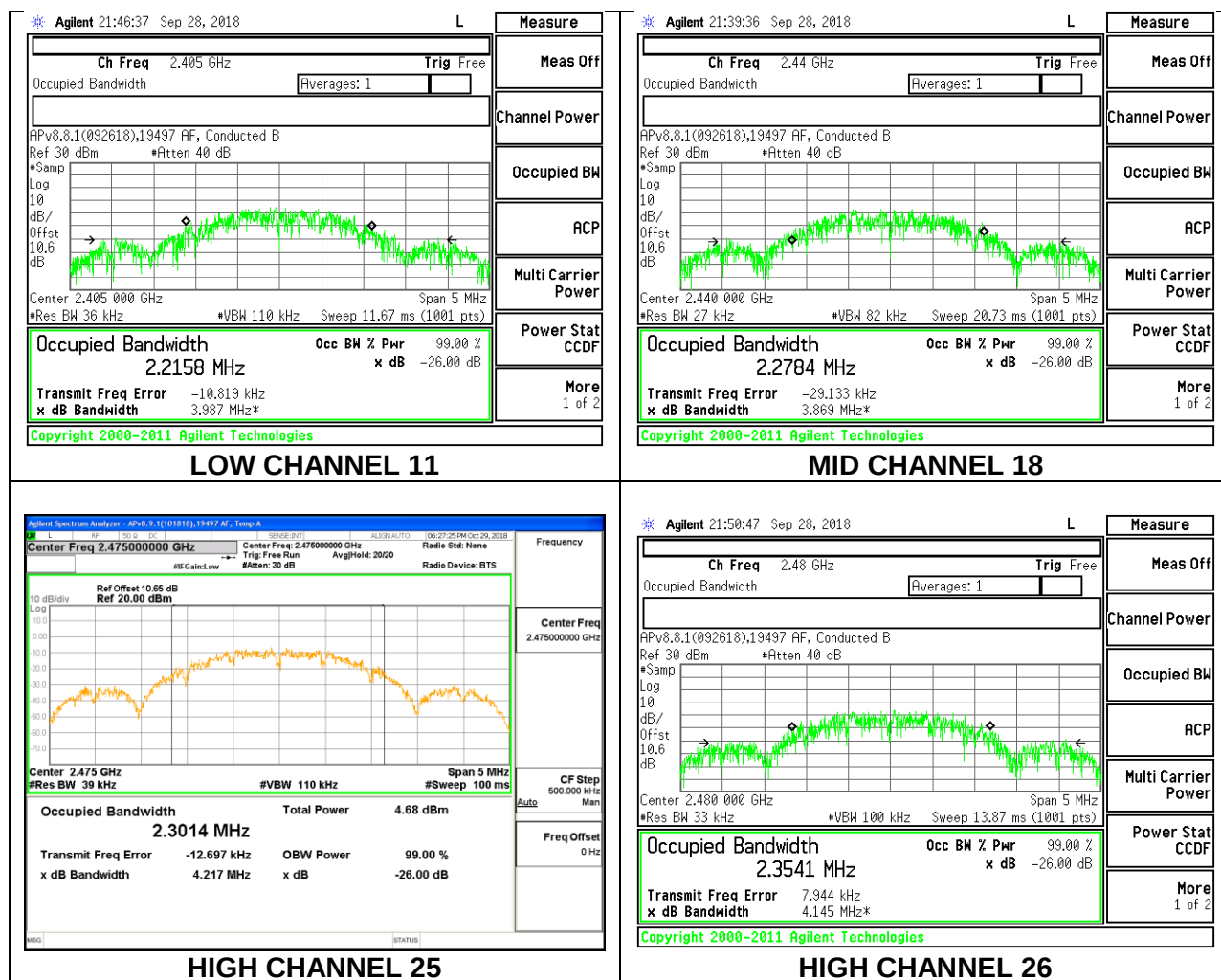
8.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low 11	2405	2.2158
Middle 18	2440	2.2784
High 25	2475	2.3014
High 26	2480	2.3541



8.3. 6 dB BANDWIDTH

LIMITS

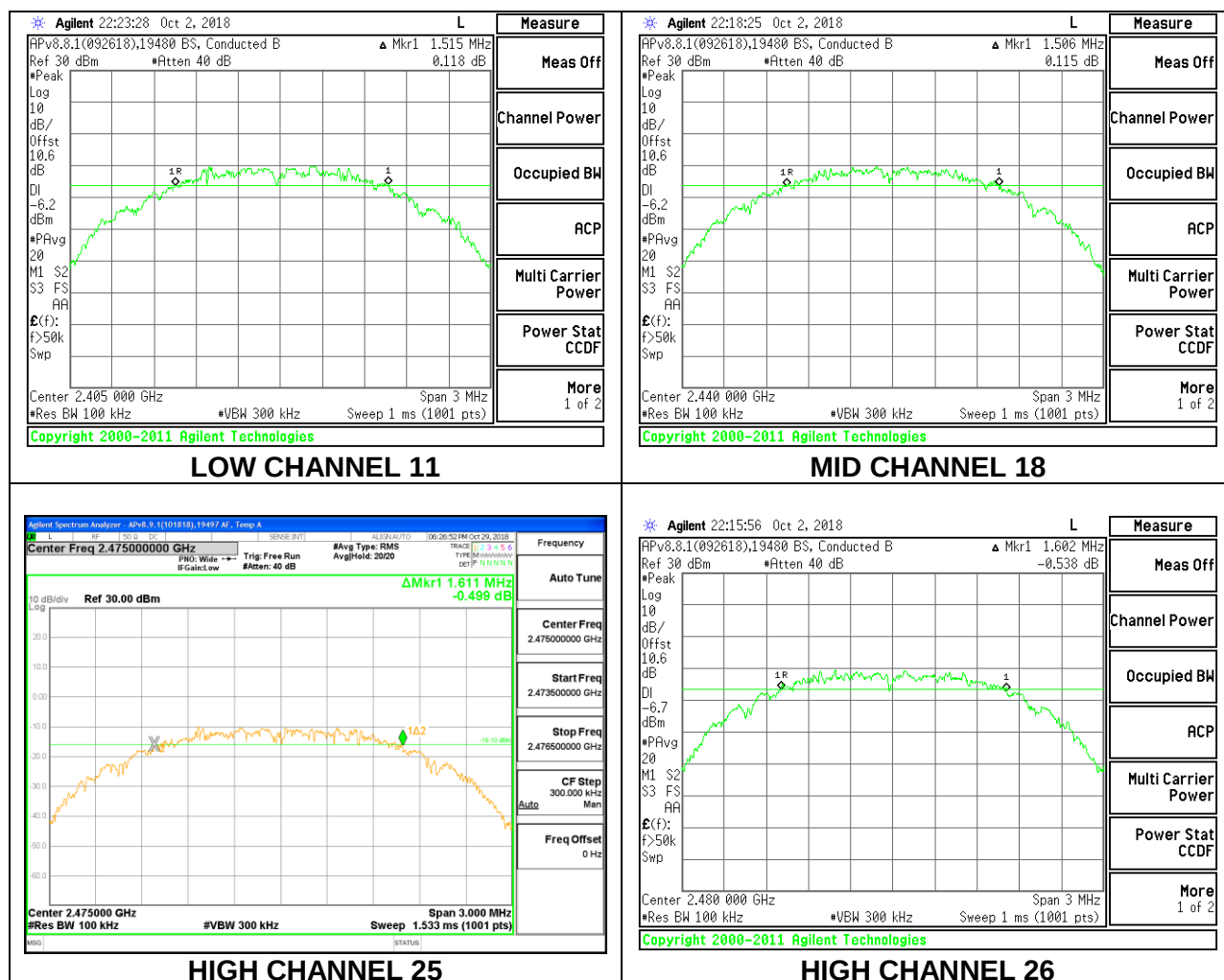
FCC §15.407 (e)

RSS-247 5.2 (a)

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

RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low 11	2405	1.515	0.5
Middle 18	2440	1.506	0.5
High 25	2475	1.611	0.5
High 26	2480	1.602	0.5



8.4. OUTPUT POWER

LIMITS

FCC §15.247 (b) (3)

RSS-247 5.4 (d)

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

TEST PROCEDURE

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

RESULTS

Tested By:	19497 AF
Date:	9/26/2018

Channel	Frequency (MHz)	Peak Power Reading (dBm)	Limit (dBm)	Margin (dB)
Low 11	2405	3.96	30	-26.040
Middle 18	2440	3.97	30	-26.030
High 25	2475	3.97	30	-26.030
High 26	2480	3.97	30	-26.030

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:	19497 AF
Date:	9/26/2018

Channel	Frequency (MHz)	AV power (dBm)
Low 11	2405	3.65
Middle 18	2440	3.70
High 25	2475	3.70
High 26	2480	3.68

8.6. POWER SPECTRAL DENSITY

LIMITS

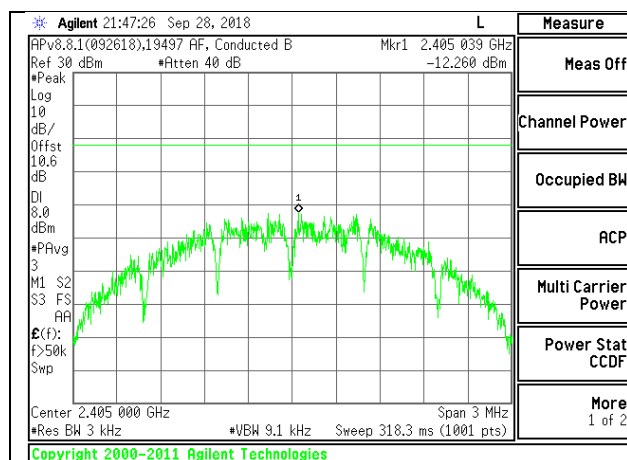
FCC §15.247 (e)

RSS-247 (5.2) (b)

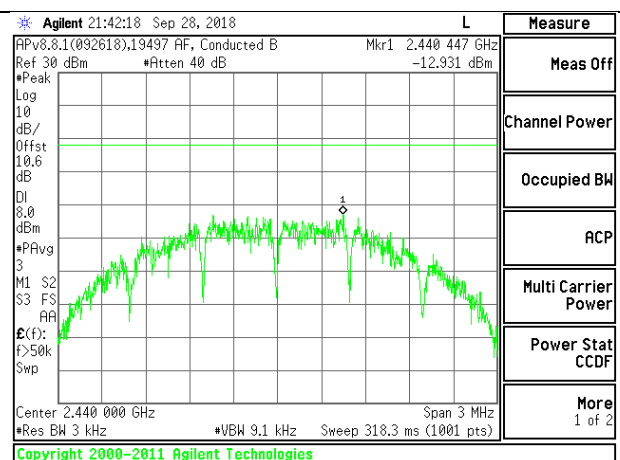
The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RESULTS

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Low 11	2405	-12.260	8	-20.26
Middle 18	2440	-12.931	8	-20.93
High 25	2475	-11.451	8	-19.45
High 26	2480	-12.540	8	-20.54



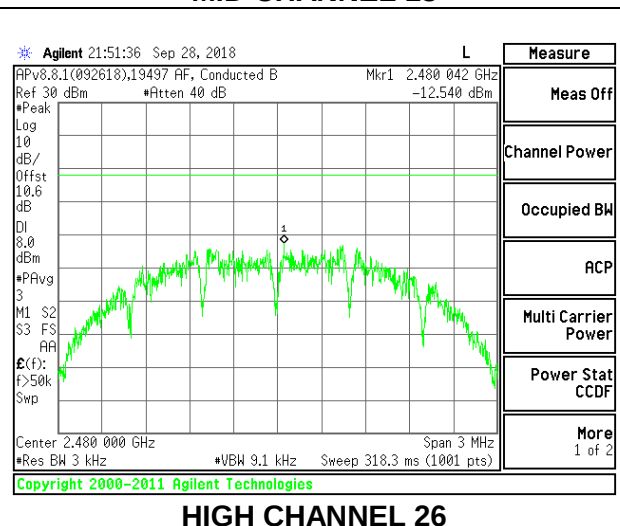
LOW CHANNEL 11



MID CHANNEL 18



HIGH CHANNEL 25



HIGH CHANNEL 26

8.7. CONDUCTED SPURIOUS EMISSIONS

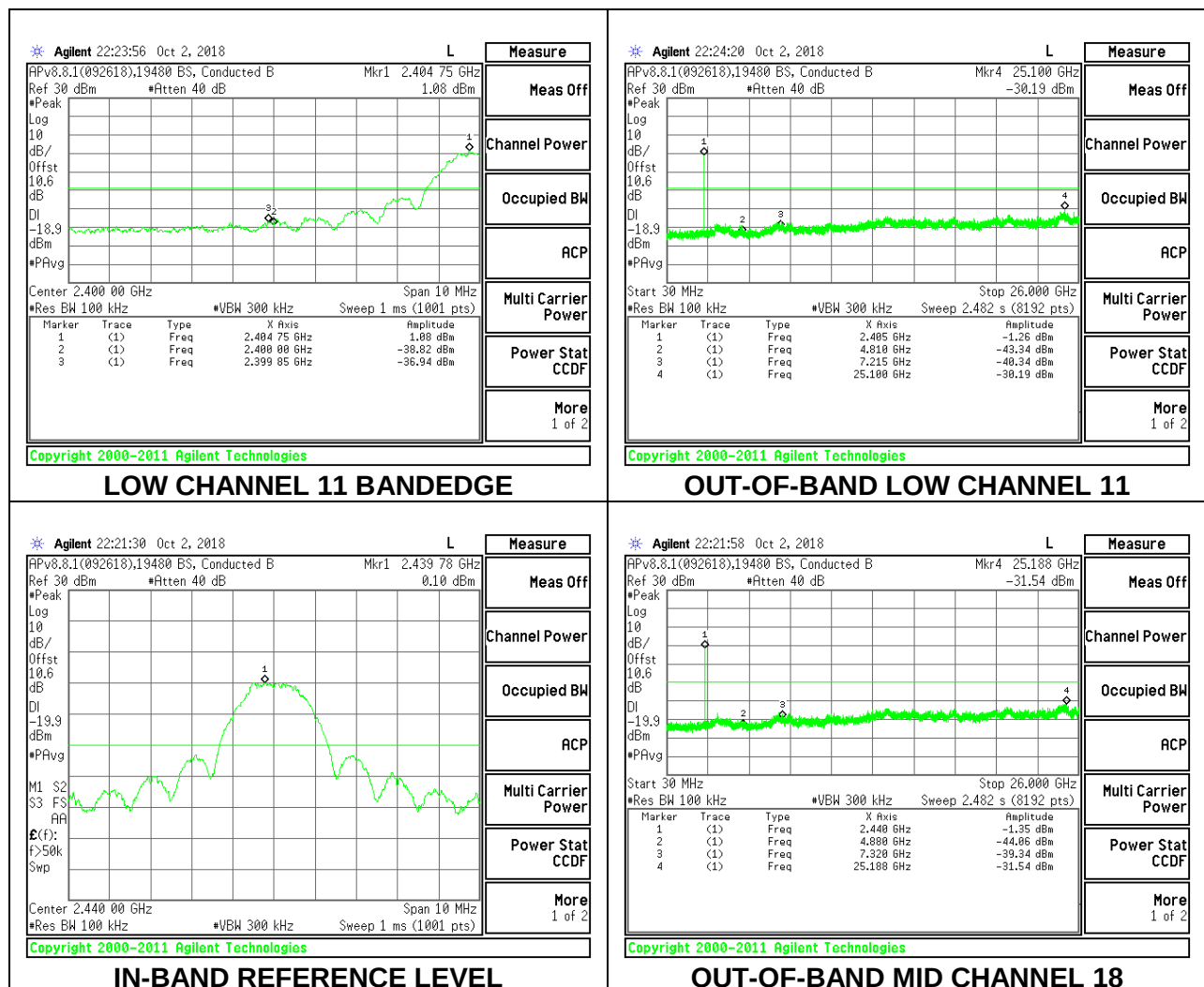
LIMITS

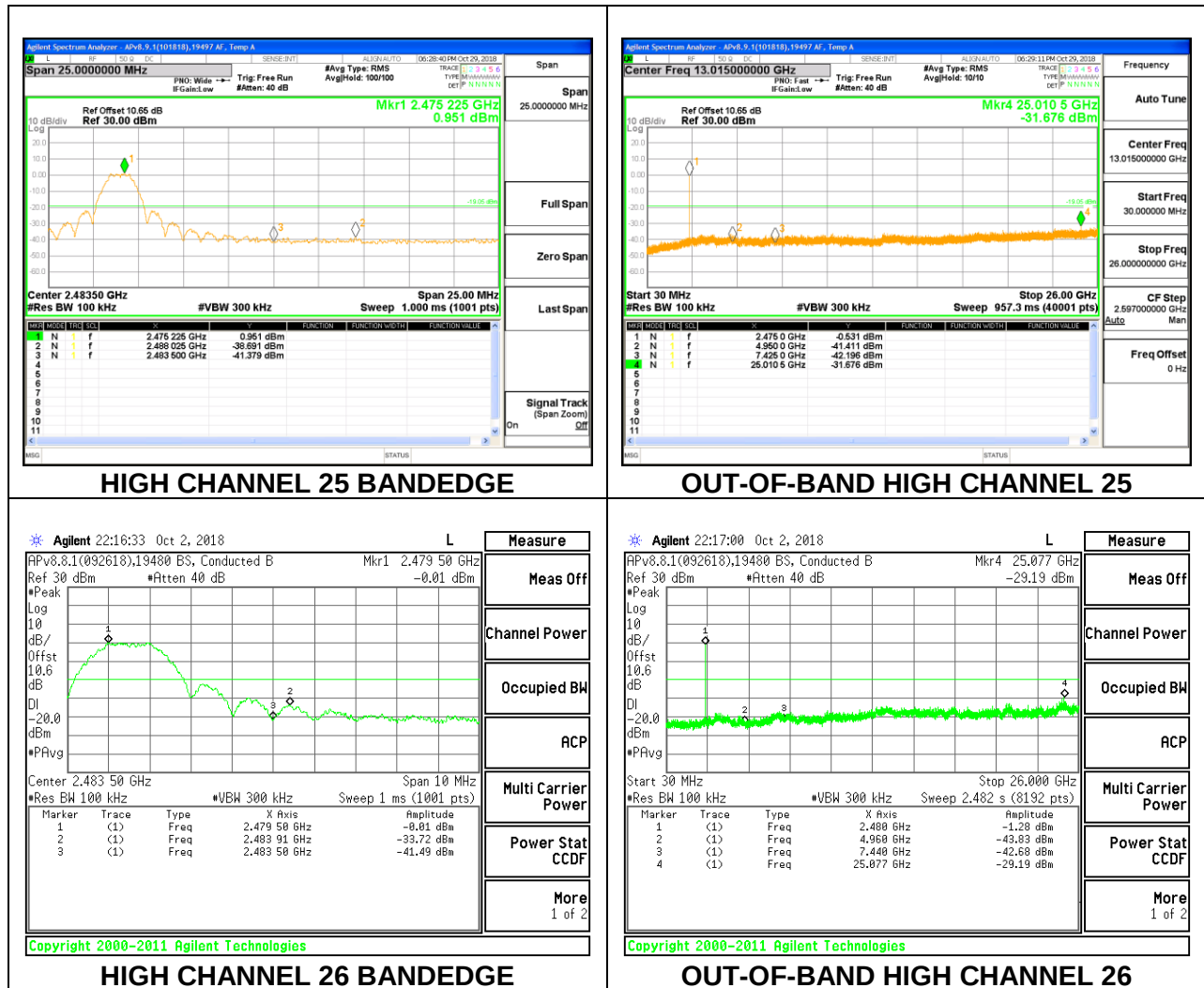
FCC §15.247 (d)

RSS-247 5.5

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

RESULTS





9. RADIATED TEST RESULTS

9.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurement below 1GHz; 1.5 m above the ground plane for measurement above 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 KHz for peak measurements.

For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements.

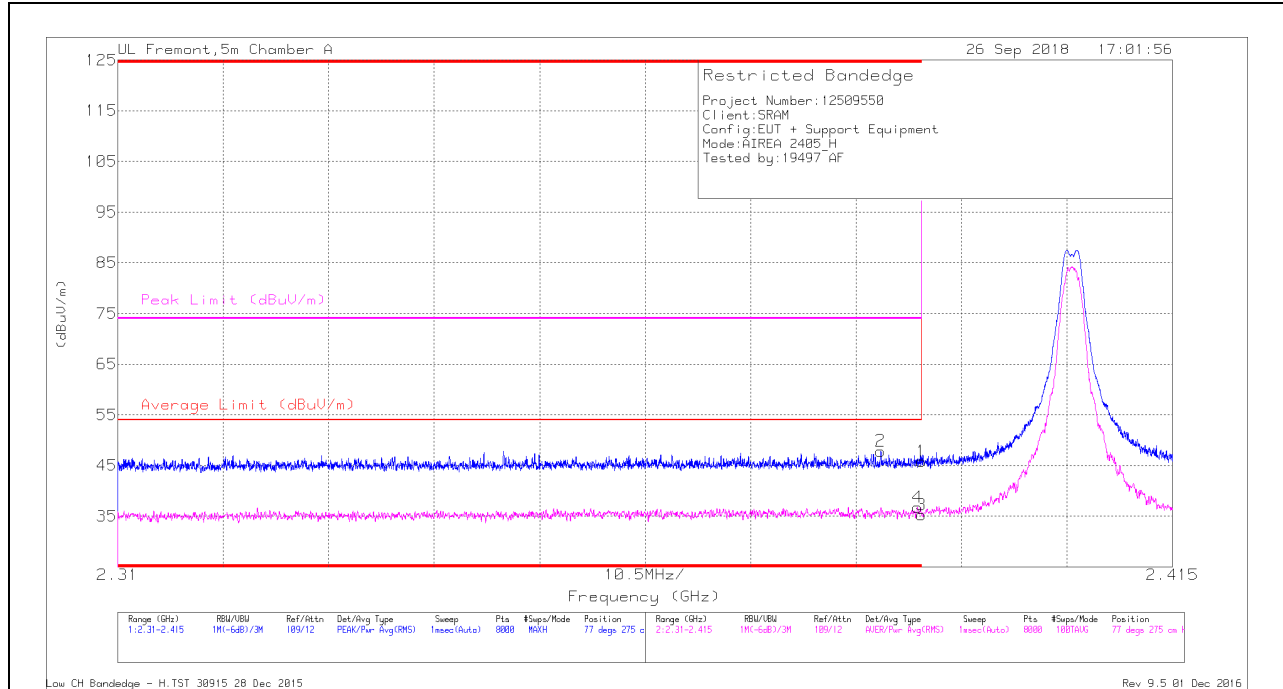
The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

9.2. TRANSMITTER ABOVE 1 GHz

BANDEDGE (LOW CHANNEL 11)

HORIZONTAL RESULT



Trace Markers

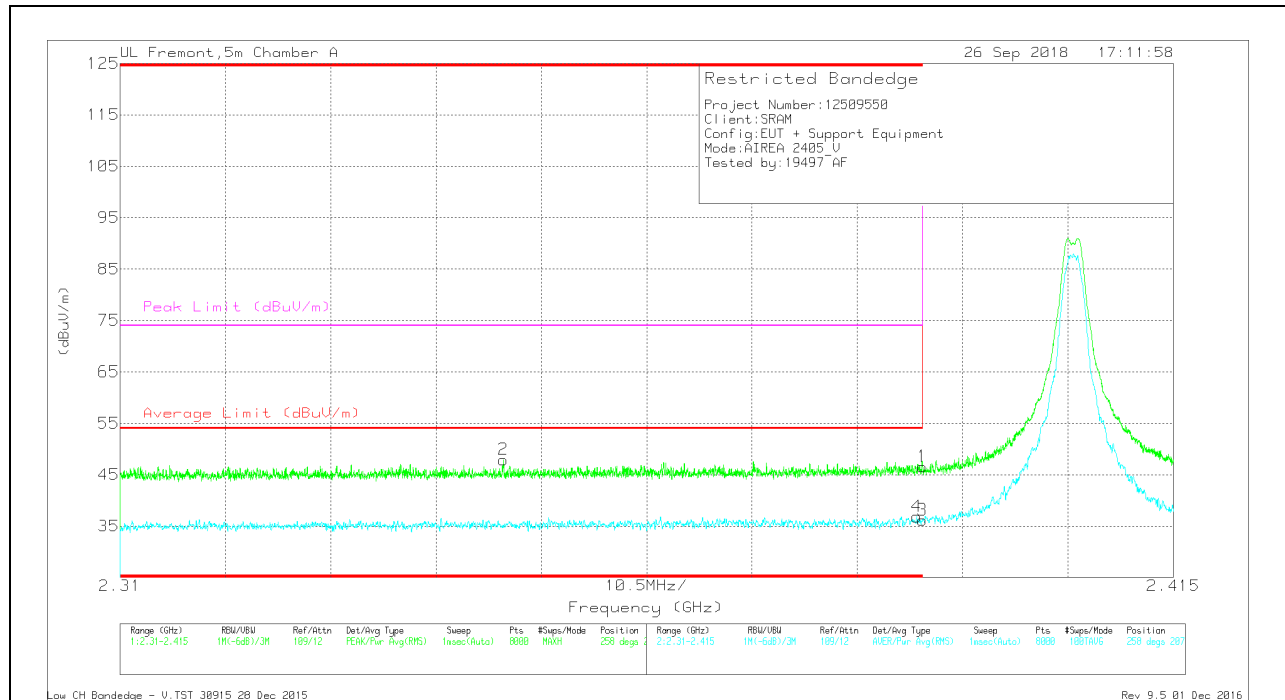
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AFT345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	37.06	Pk	31.8	-23	45.86	-	-	74	-28.14	77	275	H
2	* 2.386	39.07	Pk	31.8	-23	47.87	-	-	74	-26.13	77	275	H
3	* 2.39	26.52	RMS	31.8	-23	35.32	54	-18.68	-	-	77	275	H
4	* 2.39	27.97	RMS	31.8	-23	36.77	54	-17.23	-	-	77	275	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 T345 (dB/m)	Amp/Cb/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	37.77	Pk	31.8	-23	46.57	-	-	74	-27.43	258	207	V
2	* 2.348	39.34	Pk	31.6	-23	47.94	-	-	74	-26.06	258	207	V
3	* 2.39	27.37	RMS	31.8	-23	36.17	54	-17.83	-	-	258	207	V
4	* 2.389	28.04	RMS	31.8	-23	36.84	54	-17.16	-	-	258	207	V

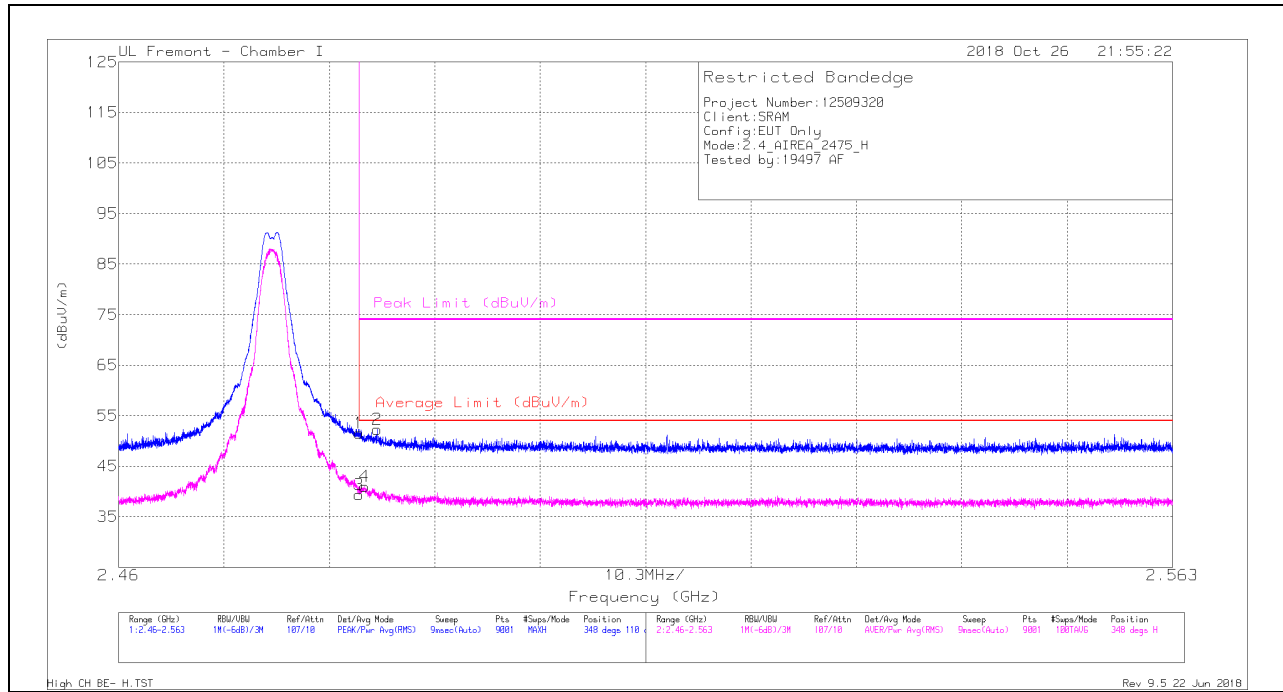
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL 25)

HORIZONTAL RESULT



Trace Markers

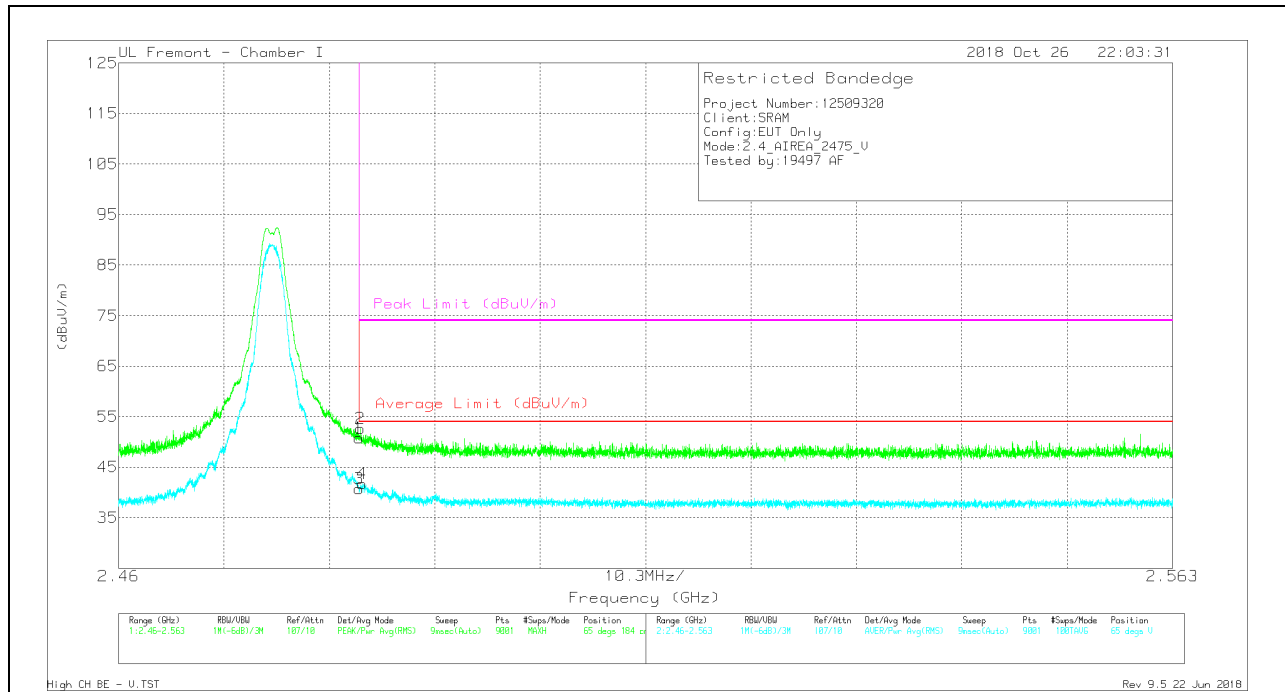
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	40.86	Pk	32.4	-21.7	51.56	-	-	74	-22.44	348	110	H
2	* 2.485	41.7	Pk	32.4	-21.8	52.3	-	-	74	-21.7	348	110	H
3	* 2.484	28.7	RMS	32.4	-21.7	39.4	54	-14.6	-	-	348	110	H
4	* 2.484	30.33	RMS	32.4	-21.7	41.03	54	-12.97	-	-	348	110	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	40.11	Pk	32.4	-21.7	50.81	-	-	74	-23.19	65	184	V
2	* 2.484	42	Pk	32.4	-21.7	52.7	-	-	74	-21.3	65	184	V
3	* 2.484	30.03	RMS	32.4	-21.7	40.73	54	-13.27	-	-	65	184	V
4	* 2.484	30.98	RMS	32.4	-21.7	41.68	54	-12.32	-	-	65	184	V

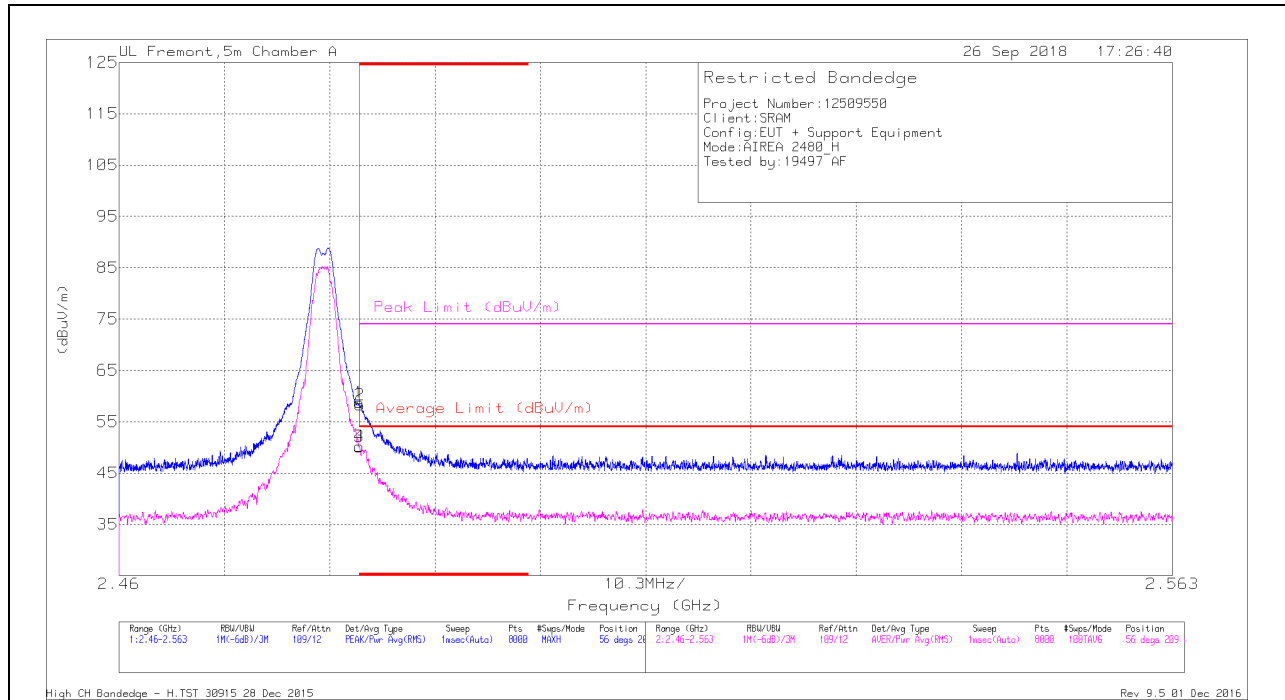
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

BANDEDGE (HIGH CHANNEL 26)

HORIZONTAL RESULT



Trace Markers

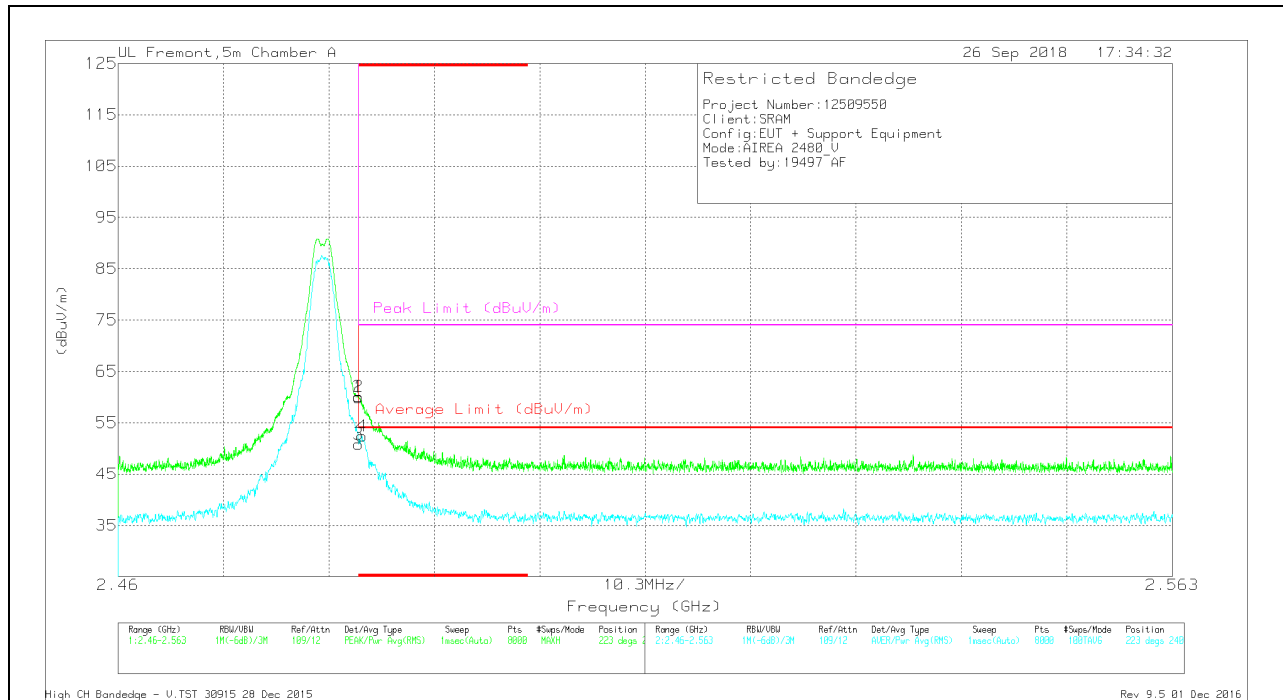
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cb/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	49.34	Pk	32.3	-22.9	58.74	-	-	74	-15.26	56	209	H
2	* 2.484	48.88	Pk	32.3	-22.9	58.28	-	-	74	-15.72	56	209	H
3	* 2.484	40.76	RMS	32.3	-22.9	50.16	54	-3.84	-	-	56	209	H
4	* 2.484	40.77	RMS	32.3	-22.9	50.17	54	-3.83	-	-	56	209	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 T345 (dB/m)	Amp/Cb/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	50.54	Pk	32.3	-22.9	59.94	-	-	74	-14.06	223	240	V
2	* 2.484	50.67	Pk	32.3	-22.9	60.07	-	-	74	-13.93	223	240	V
3	* 2.484	41.45	RMS	32.3	-22.9	50.85	54	-3.15	-	-	223	240	V
4	* 2.484	42.98	RMS	32.3	-22.9	52.38	54	-1.62	-	-	223	240	V

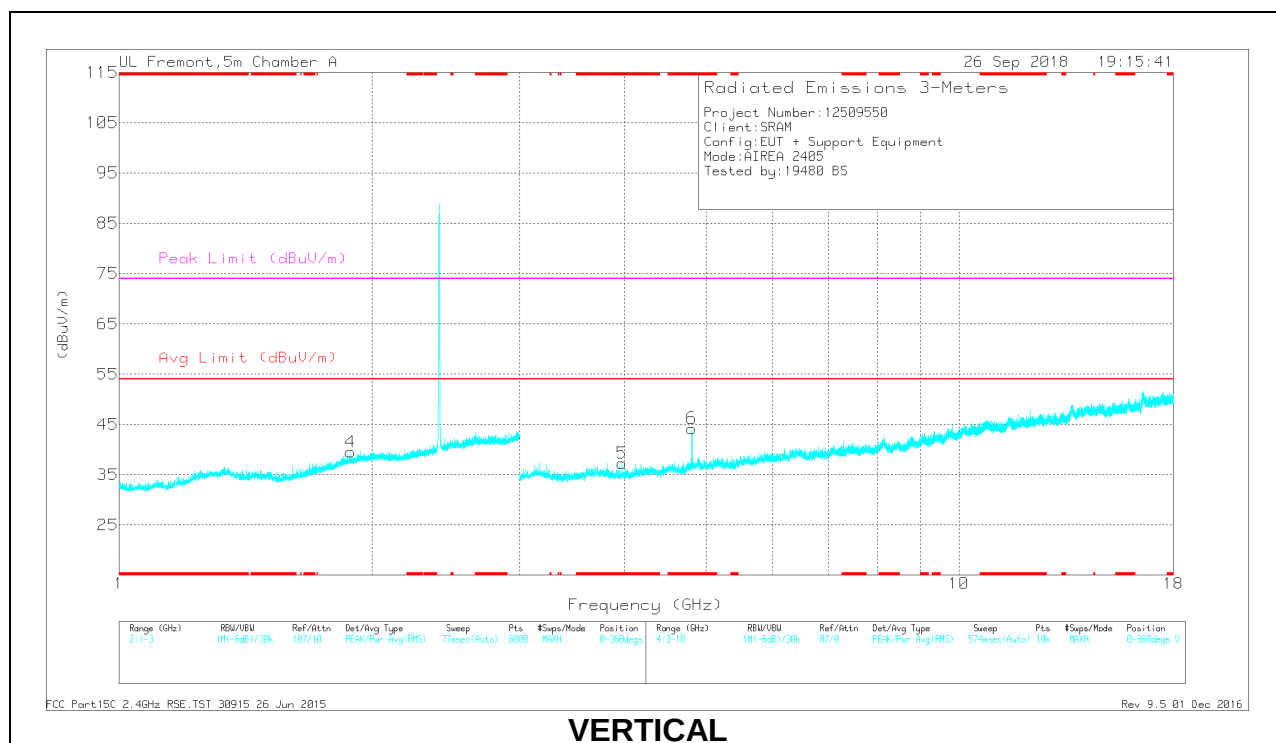
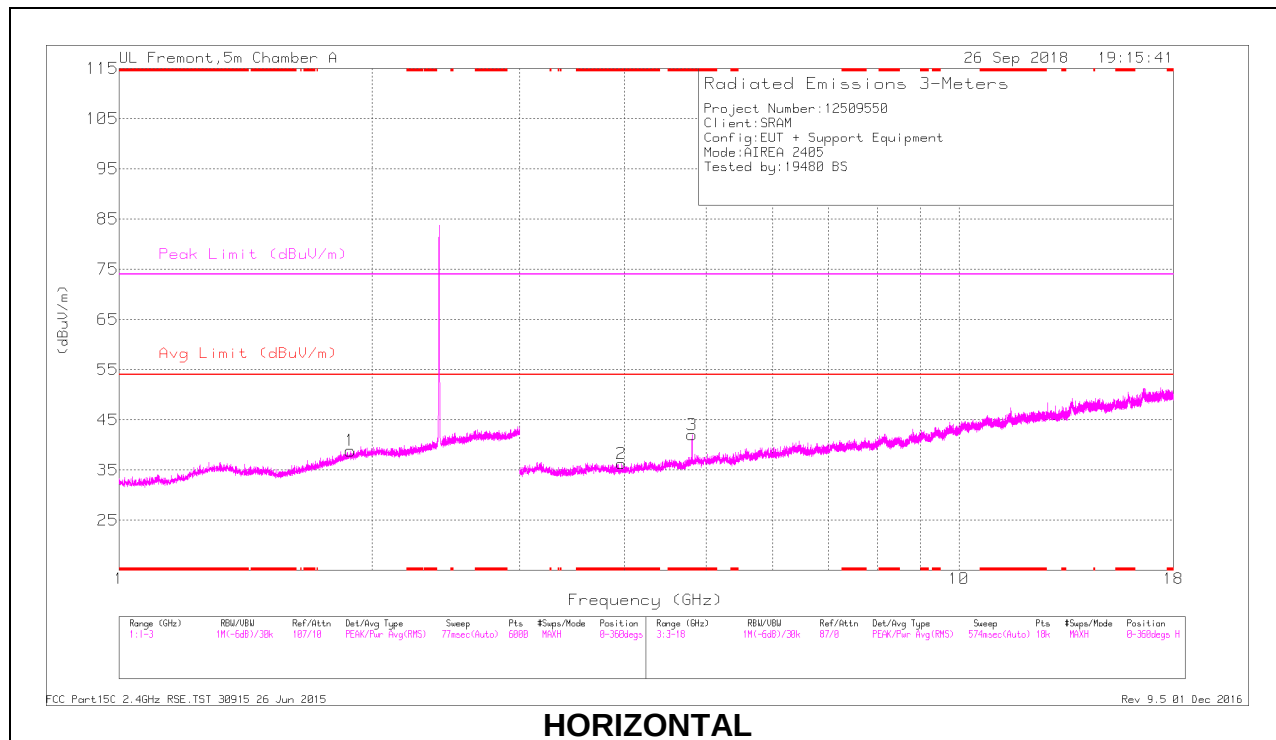
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

RMS - RMS detection

HARMONICS AND SPURIOUS EMISSIONS

LOW CHANNEL 11 RESULTS



RADIATED EMISSIONS

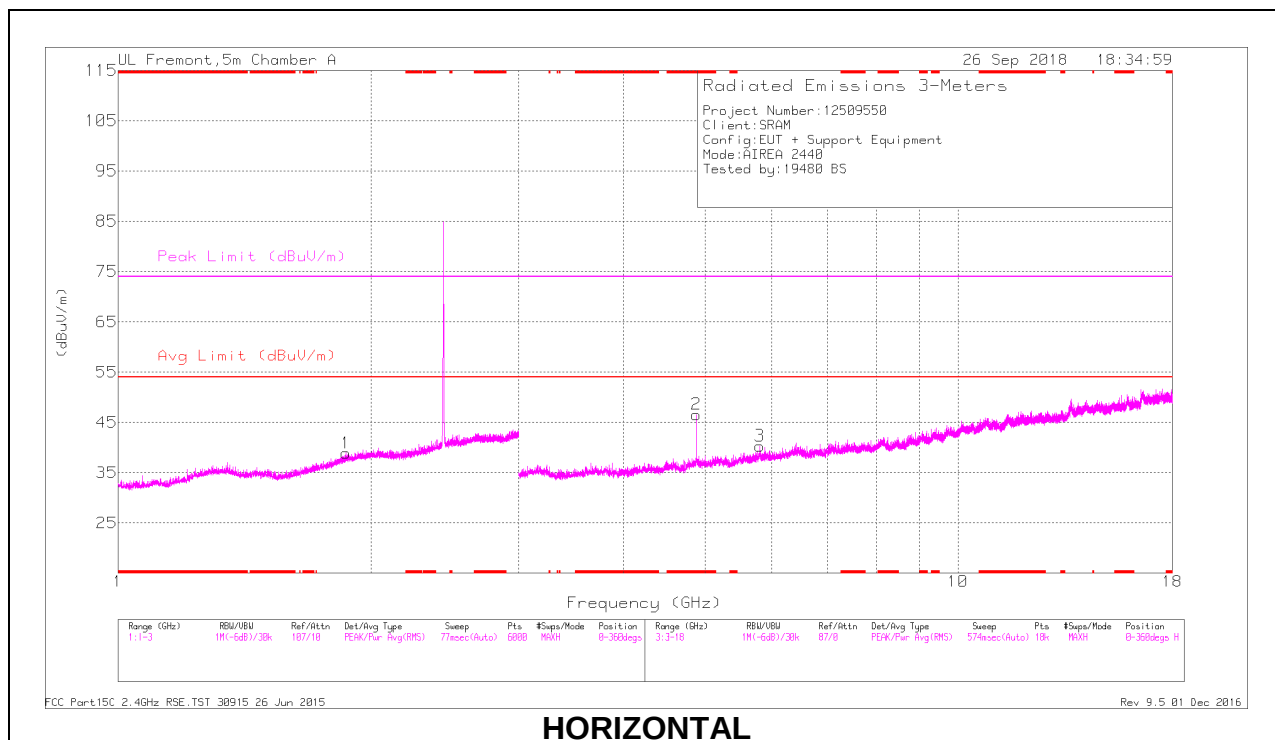
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 3.966	37.68	PK2	33.3	-27.8	43.18	-	-	74	-30.82	166	141	H
	* 3.967	25.26	MAv1	33.3	-27.8	30.76	54	-23.24	-	-	166	141	H
3	* 4.809	39.45	PK2	34.2	-26	47.65	-	-	74	-26.35	191	102	H
	* 4.809	30.31	MAv1	34.2	-26	38.51	54	-15.49	-	-	191	102	H
5	* 3.969	36.93	PK2	33.3	-27.7	42.53	-	-	74	-31.47	32	315	V
	* 3.972	25.23	MAv1	33.3	-27.8	30.73	54	-23.27	-	-	32	315	V
6	* 4.809	40.97	PK2	34.2	-26	49.17	-	-	74	-24.83	332	234	V
	* 4.809	33.07	MAv1	34.2	-26	41.27	54	-12.73	-	-	332	234	V
1	1.886	36.17	PK2	31	-22.9	44.27	-	-	-	-	316	307	H
4	1.886	36.69	PK2	31	-22.9	44.79	-	-	-	-	63	339	V

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

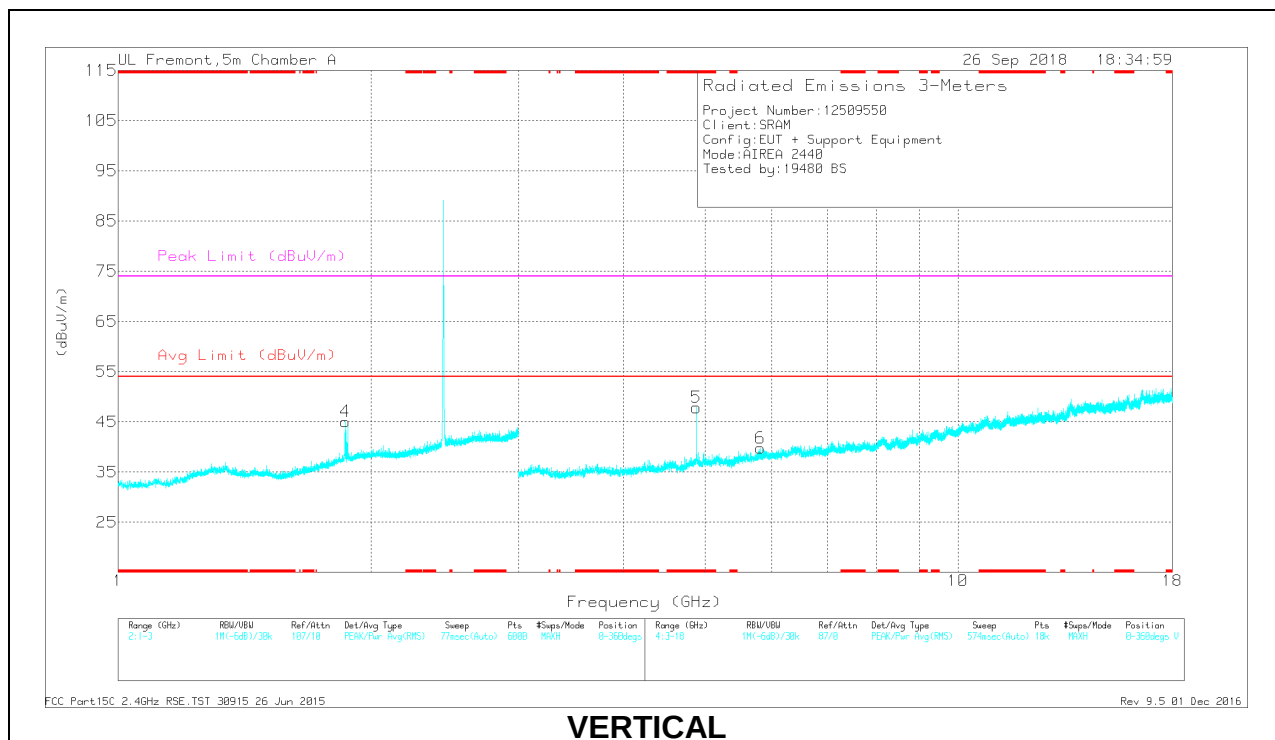
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

MID CHANNEL 18 RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

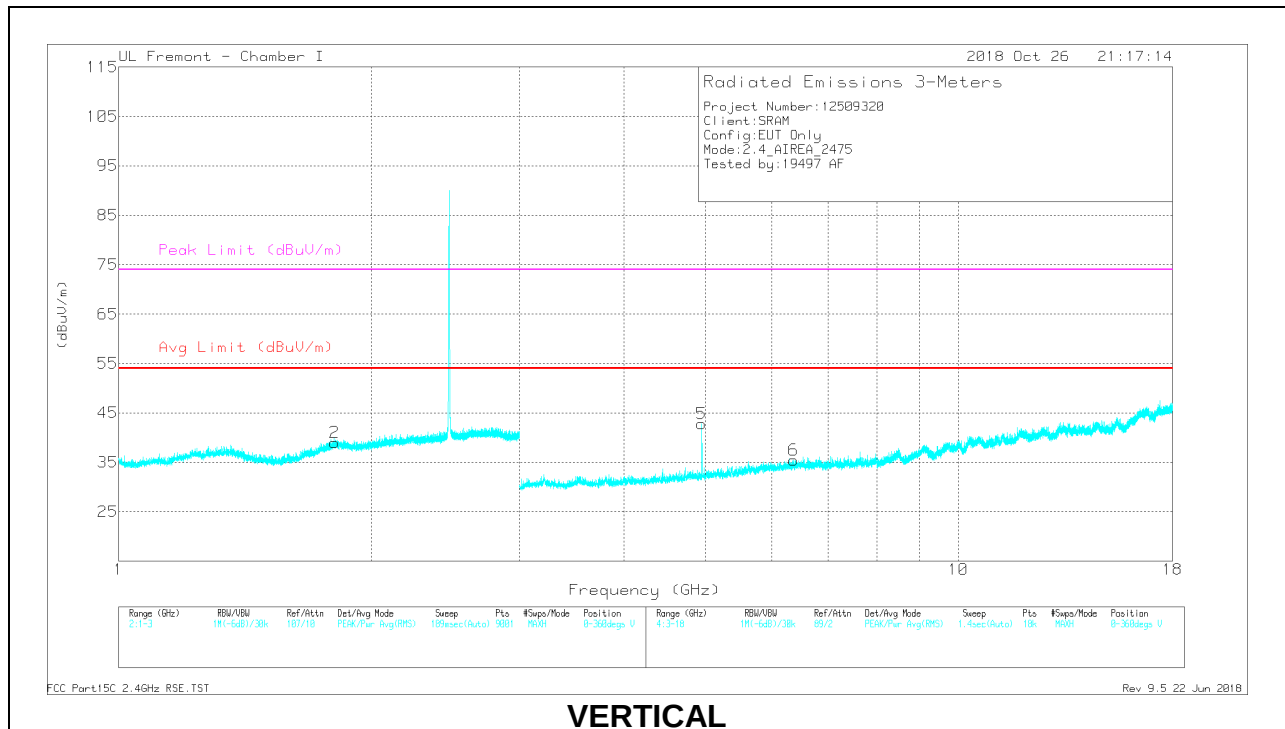
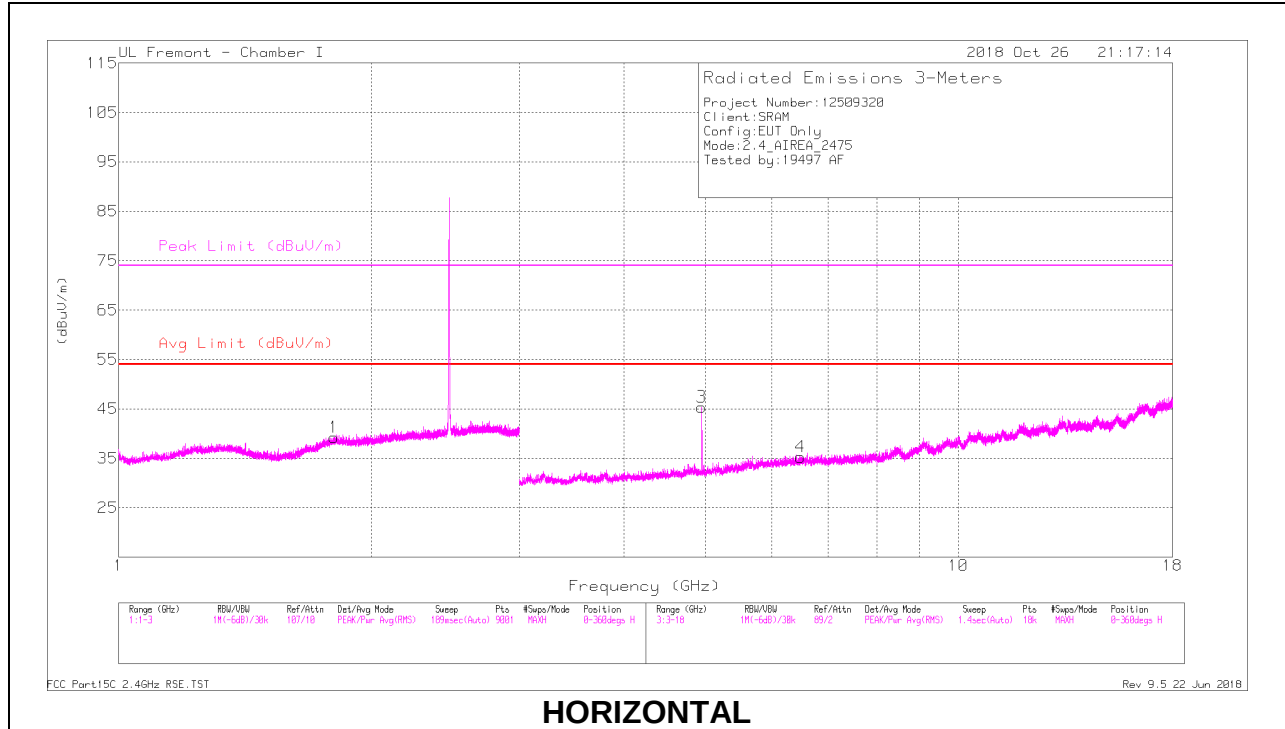
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.881	44.06	PK2	34.1	-26	52.16	-	-	74	-21.84	175	103	H
	* 4.881	37.21	MAv1	34.1	-26	45.31	54	-8.69	-	-	175	103	H
5	* 4.881	44.08	PK2	34.1	-26	52.18	-	-	74	-21.82	315	194	V
	* 4.881	36.99	MAv1	34.1	-26	45.09	54	-8.91	-	-	315	194	V
4	1.864	36.73	PK2	30.9	-22.9	44.73	-	-	-	-	315	185	V
1	1.869	36.15	PK2	31	-22.9	44.25	-	-	-	-	70	139	H
3	5.812	35.64	PK2	35.1	-24.7	46.04	-	-	-	-	307	320	H
6	5.816	35.18	PK2	35.1	-24.7	45.58	-	-	-	-	140	102	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 25 RESULTS



RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.806	38.13	PK2	30.6	-22.2	46.53	-	-	-	-	159	196	H
2	1.809	37.24	PK2	30.6	-22.2	45.64	-	-	-	-	146	376	V
3	* 4.951	45.89	PK2	34.2	-29.1	50.99	-	-	74	-23.01	284	246	H
	* 4.951	38.85	MAv1	34.2	-29.1	43.95	54	-10.05	-	-	284	246	H
4	6.495	33.38	PK2	35.7	-26.4	42.68	-	-	-	-	226	388	H
5	* 4.949	42.68	PK2	34.2	-29.1	47.78	-	-	74	-26.22	20	184	V
	* 4.949	35.7	MAv1	34.2	-29.1	40.8	54	-13.2	-	-	20	184	V
6	6.371	33.24	PK2	35.7	-27.2	41.74	-	-	-	-	130	344	V

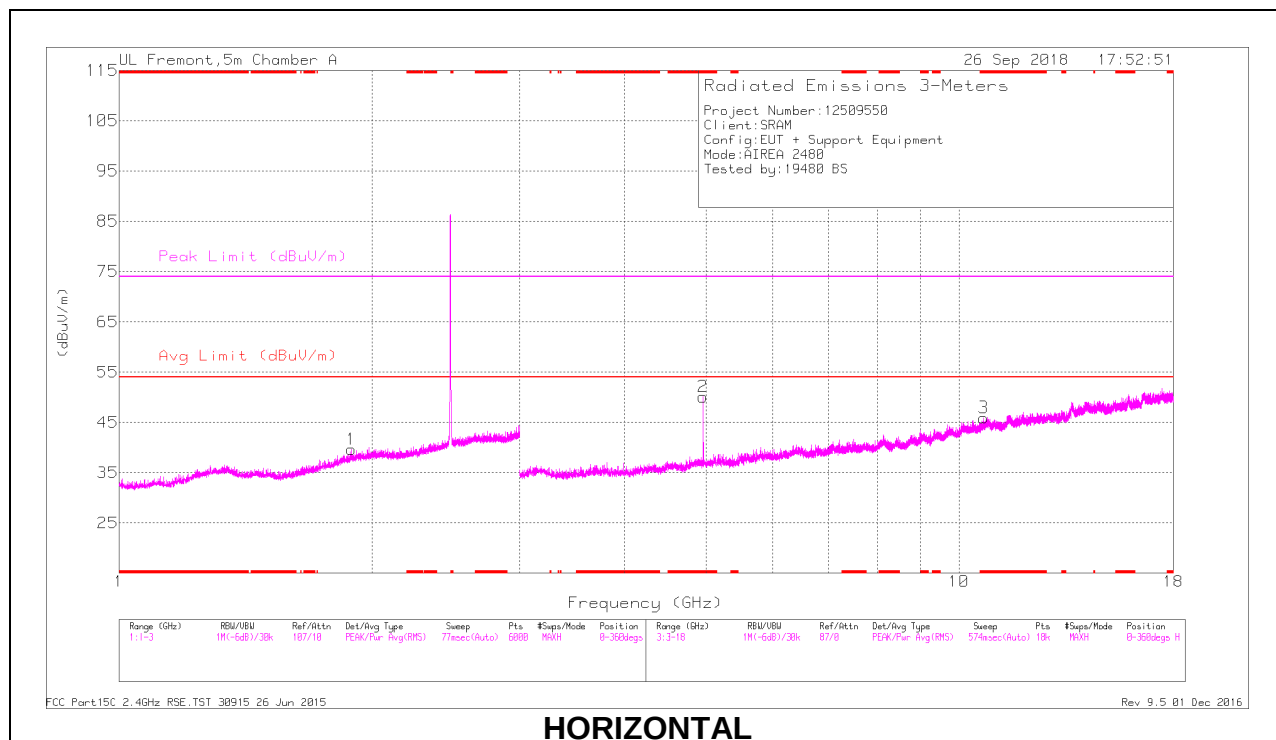
* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

PK2 - KDB558074 Method: Maximum Peak

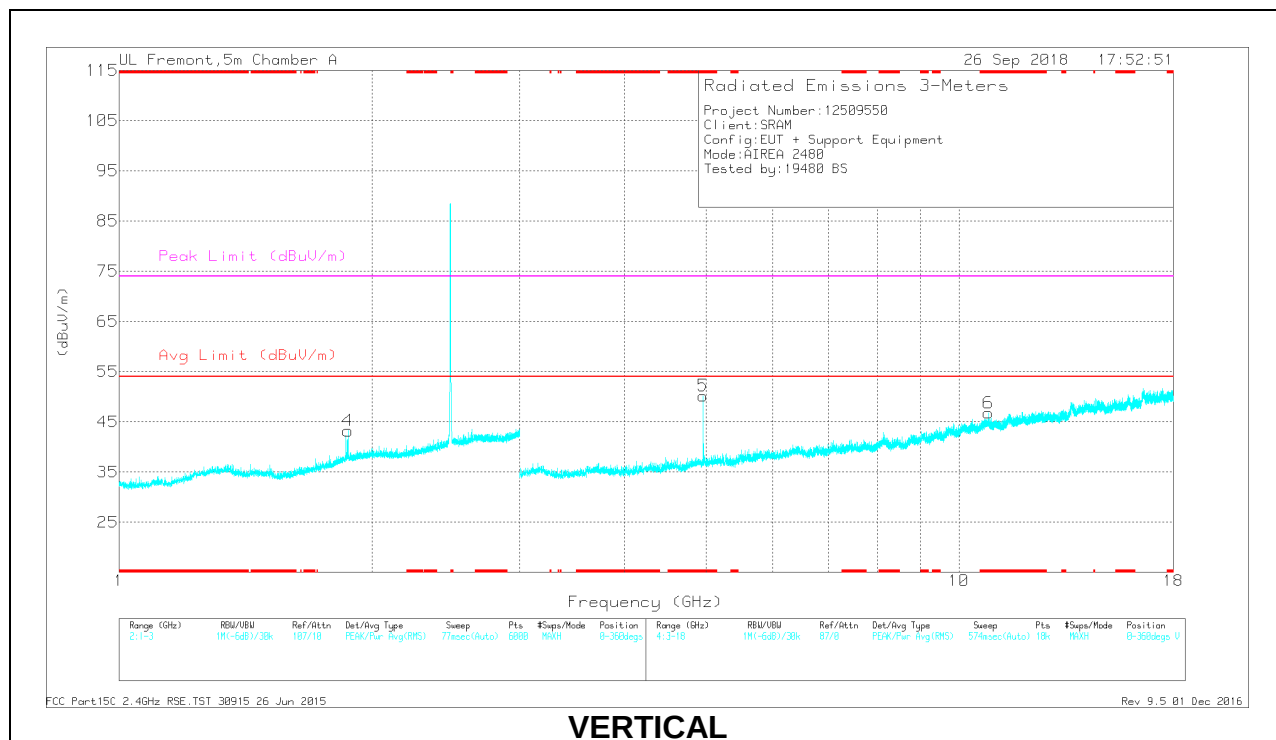
MAv1 - KDB558074 Option 1 Maximum RMS Average

FCC Part15C 2.4GHz RSE.TST 30915 26 Jun 2015

HIGH CHANNEL 26 RESULTS



HORIZONTAL



VERTICAL

RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (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
2	* 4.959	47.32	PK2	34.2	-26.6	54.92	-	-	74	-19.08	175	116	H
	* 4.959	41.05	MAv1	34.2	-26.6	48.65	54	-5.35	-	-	175	116	H
3	* 10.701	32.2	PK2	37.8	-18.6	51.4	-	-	74	-22.6	46	145	H
	* 10.7	20.55	MAv1	37.8	-18.6	39.75	54	-14.25	-	-	46	145	H
5	* 4.959	47.47	PK2	34.2	-26.6	55.07	-	-	74	-18.93	313	207	V
	* 4.959	41.39	MAv1	34.2	-26.6	48.99	54	-5.01	-	-	313	207	V
6	* 10.842	31.29	PK2	37.9	-18.1	51.09	-	-	74	-22.91	221	127	V
	* 10.84	20.23	MAv1	37.9	-18.1	40.03	54	-13.97	-	-	221	127	V
4	1.874	36.43	PK2	31	-22.9	44.53	-	-	-	-	357	199	V
1	1.891	36.18	PK2	31	-22.9	44.28	-	-	-	-	243	227	H

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

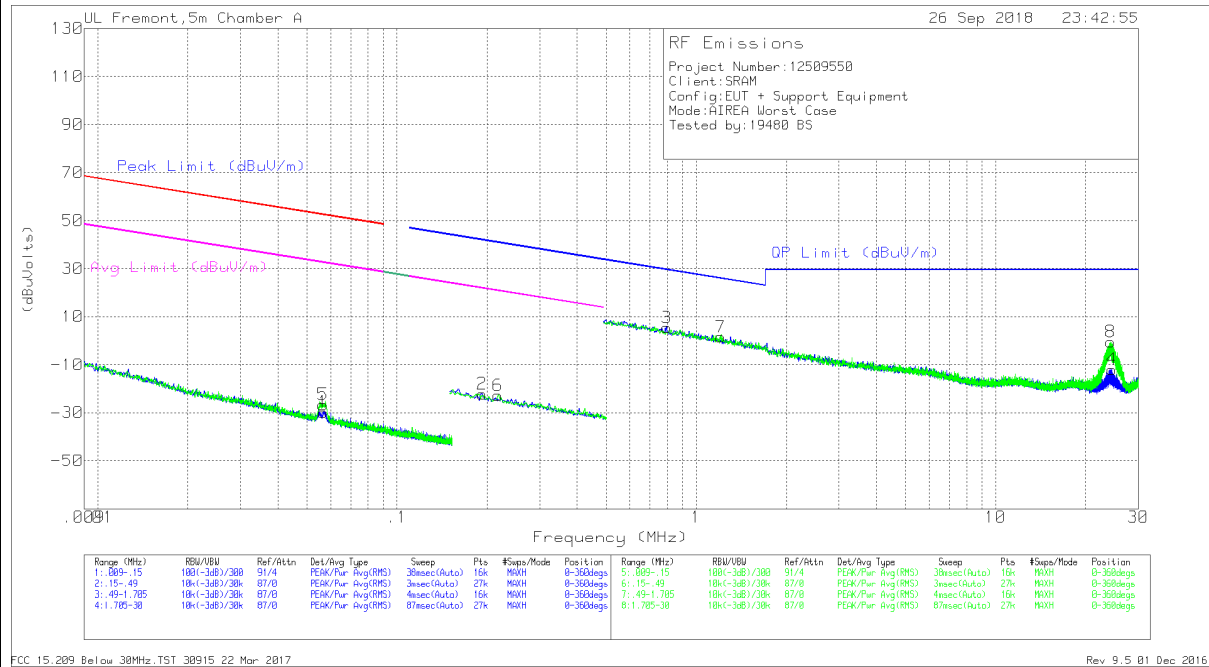
PK2 - KDB558074 Method: Maximum Peak

MAv1 - KDB558074 Option 1 Maximum RMS Average

FCC Part15C 2.4GHz RSE.TST 30915 26 Jun 2015

9.3. 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 (dBuV/m)	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)
5	.05661	41.47	Pk	11.8	.1	-80	-26.63	52.53	-79.16	32.53	-59.16	-	-	-	-	0-360
1	.05681	38.38	Pk	11.8	.1	-80	-29.72	52.5	-82.22	32.5	-62.22	-	-	-	-	0-360
2	.19233	46.75	Pk	11	.1	-80	-22.15	-	-	-	-	41.94	-64.09	21.94	-44.09	0-360
6	.21744	46.13	Pk	11	.1	-80	-22.77	-	-	-	-	40.87	-63.64	20.87	-43.64	0-360

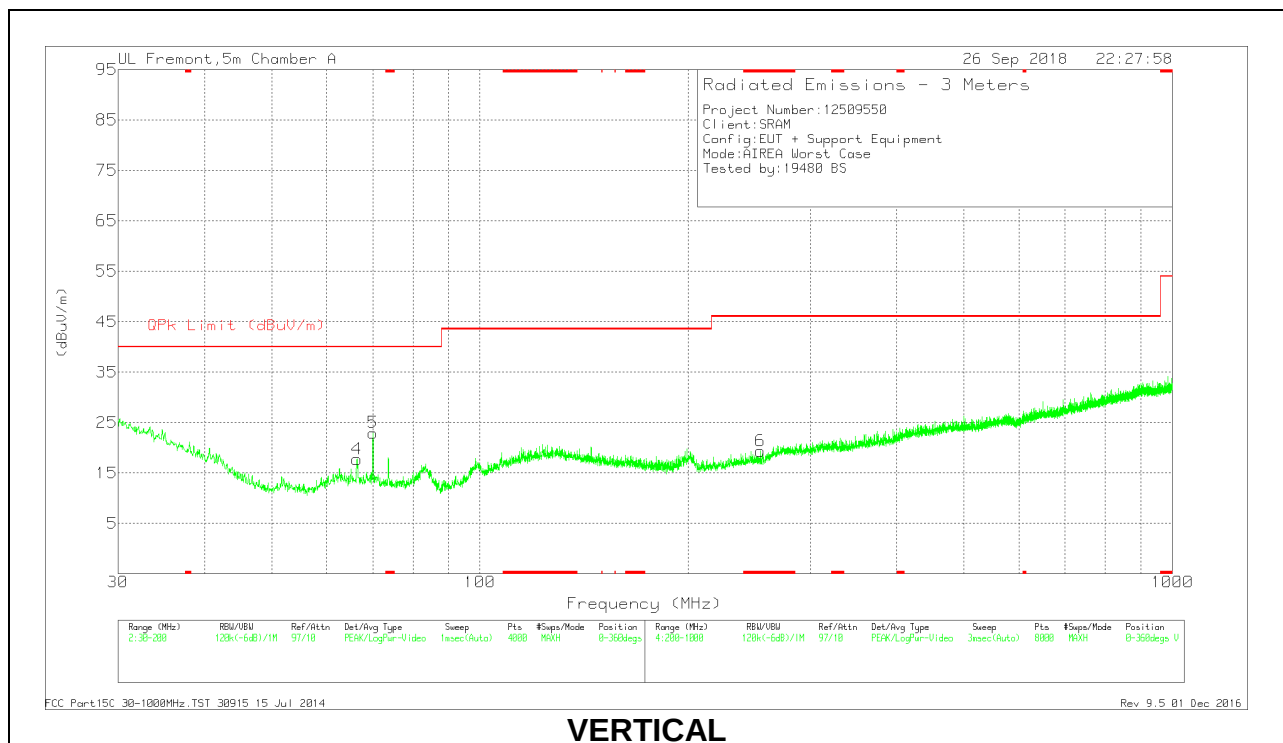
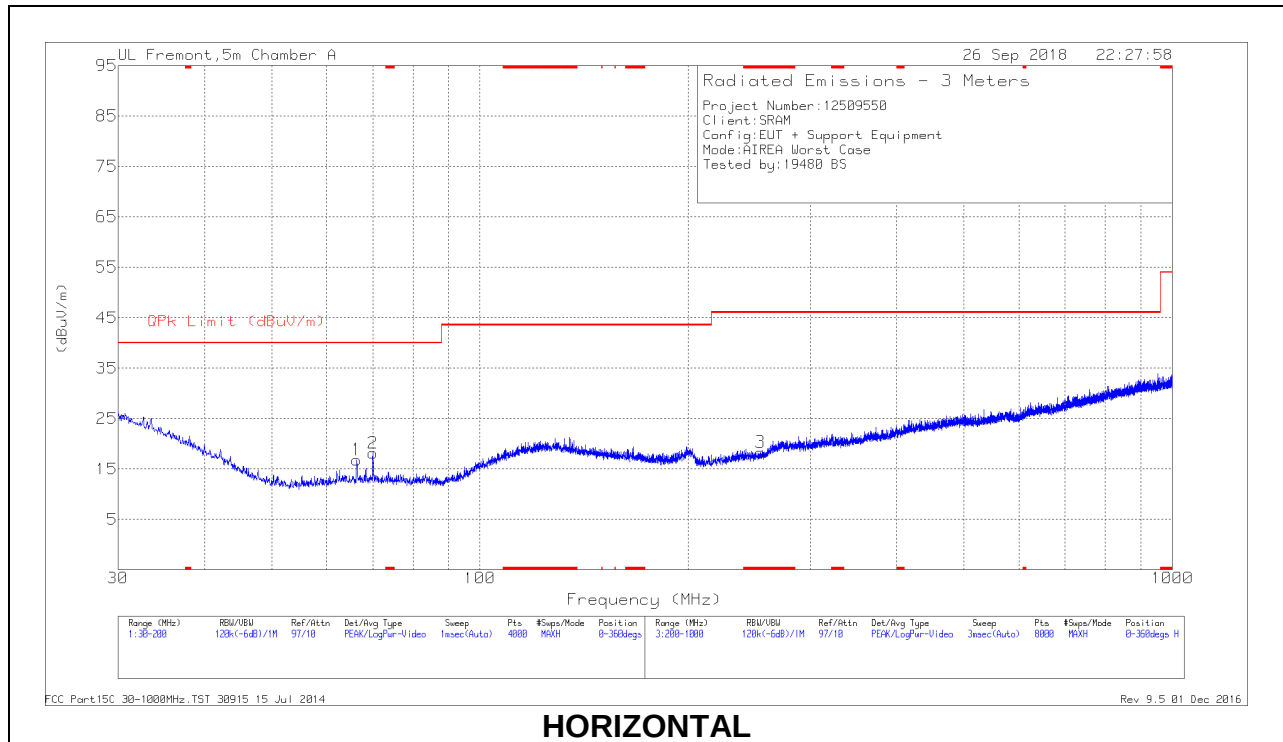
Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.79689	34.37	Pk	11	.1	-40	5.47	29.59	-24.12	-	-	-	-	0-360
7	1.20752	29.98	Pk	11.3	.2	-40	1.48	25.99	-24.51	-	-	-	-	0-360
8	24.23386	28.3	Pk	10.5	.7	-40	-5	29.5	-30	-	-	-	-	0-360
4	24.47752	16.85	Pk	10.5	.7	-40	-11.95	29.5	-41.45	-	-	-	-	0-360

Pk - Peak detector

9.4. Worst Case Below 1 GHz

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



Below 1GHz Data

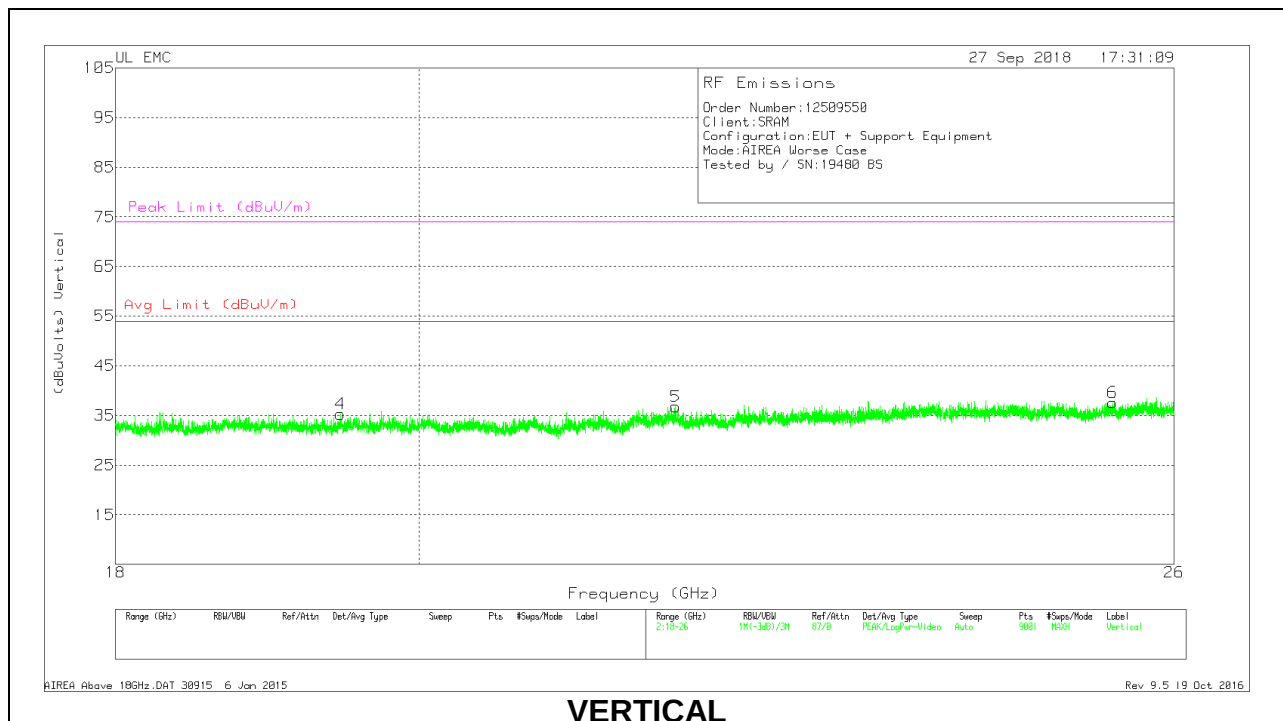
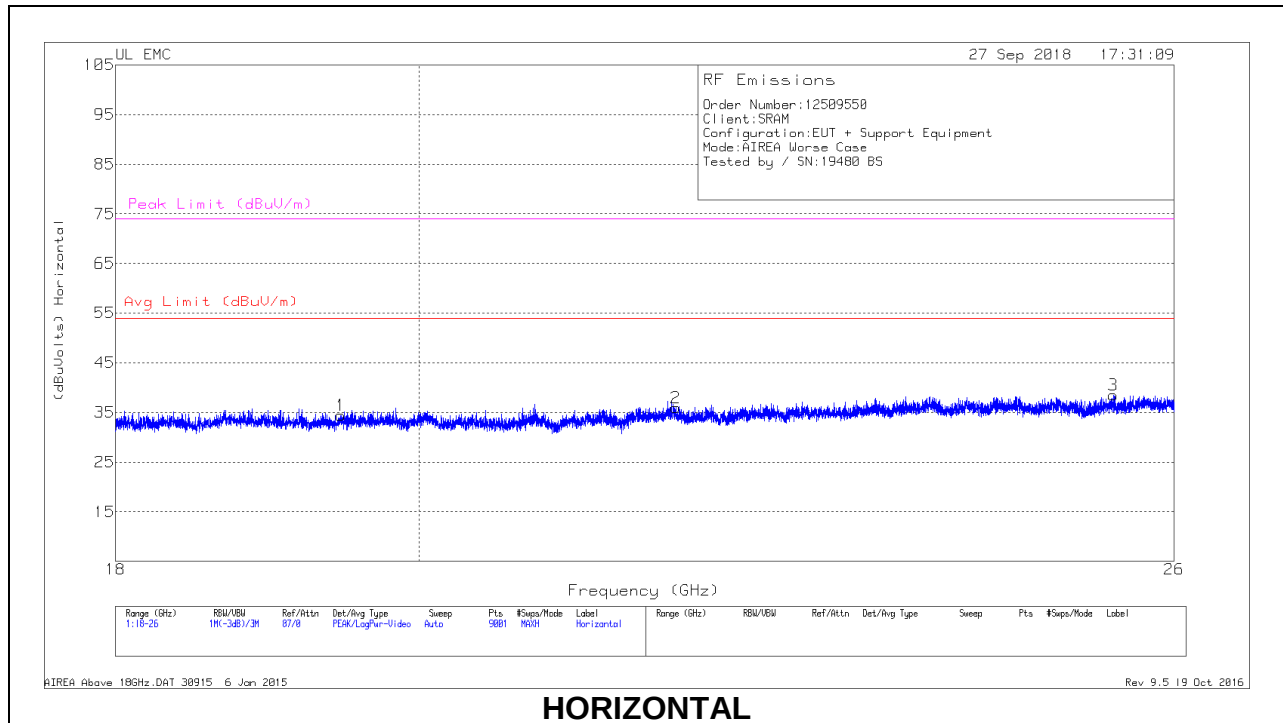
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AFT130 (dB/m)	Amp/Cbl (dB/m)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3	* 254.107	27.72	Pk	15.4	-24.8	18.32	46.02	-27.7	0-360	101	H
6	* 254.107	28.76	Pk	15.4	-24.8	19.36	46.02	-26.66	0-360	200	V
1	66.3894	31.52	Pk	12.1	-26.8	16.82	40	-23.18	0-360	100	H
4	66.4319	32.43	Pk	12.1	-26.8	17.73	40	-22.27	0-360	100	V
2	70.0454	32.75	Pk	12.1	-26.7	18.15	40	-21.85	0-360	100	H
5	70.0454	37.56	Pk	12.1	-26.7	22.96	40	-17.04	0-360	100	V

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

Pk - Peak detector

9.5. Worst Case 18-26 GHz

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



18 – 26GHz DATA

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	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	19.464	35.99	Pk	32.5	-24.6	-9.5	34.39	54	-19.61	74	-39.61
2	21.866	36.75	Pk	33.3	-24.6	-9.5	35.95	54	-18.05	74	-38.05
3	25.455	38.68	Pk	33.8	-24.5	-9.5	38.48	54	-15.52	74	-35.52
4	19.462	36.88	Pk	32.5	-24.6	-9.5	35.28	54	-18.72	74	-38.72
5	21.865	37.57	Pk	33.3	-24.6	-9.5	36.77	54	-17.23	74	-37.23
6	25.452	37.78	Pk	33.8	-24.5	-9.5	37.58	54	-16.42	74	-36.42

Pk - Peak detector