



# **CERTIFICATION TEST REPORT**

**Report Number. :** 12509320-E3V2

**Applicant :** SRAM LLC  
1000 W Fulton Market 4<sup>th</sup> 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-210 ISSUE 9  
ISED RSS-GEN ISSUE 5

**Date Of Issue:**  
October 22, 2018

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



NVLAP Lab code: 200065-0

## REPORT REVISION HISTORY

Rev.	Issue Date	Revisions	Revised By
V1	10/5/2018	Initial Issue	
V2	10/22/2018	Updated Section 5.5	Steven Tran

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## 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** Rear Derailleur with BLE, AIREA and ANT+ Radios  
**MODEL:** 12920

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

**DATE TESTED:** SEPTEMBER 21 – OCTOBER 4, 2018

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Complies
ISED RSS-210 Issue 9	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 v05RSS-GEN Issue 5, and RSS-210 Issue 9.

## 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 (ISED:2324B-1)	<input type="checkbox"/> Chamber D (ISED:22541-1)	<input type="checkbox"/> Chamber I (ISED:2324A-5)
<input checked="" type="checkbox"/> Chamber B (ISED:2324B-2)	<input type="checkbox"/> Chamber E (ISED:22541-2)	<input type="checkbox"/> Chamber J (ISED:2324A-6)
<input type="checkbox"/> Chamber C (ISED:2324B-3)	<input type="checkbox"/> Chamber F (ISED:22541-3)	<input type="checkbox"/> Chamber K (ISED:2324A-1)
	<input type="checkbox"/> Chamber G (ISED:22541-4)	<input type="checkbox"/> Chamber L (ISED:2324A-3)
	<input type="checkbox"/> 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:

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

#### **MAINS CONDUCTED EMISSIONS**

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{Final Voltage (dBuV)} &= \text{Measured Voltage (dBuV)} + \text{Cable Loss (dB)} + \text{Limiter Factor (dB)} + \\ &\text{LISN Insertion Loss.} \\ 36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} &= 46.6 \text{ dBuV} \end{aligned}$$

### 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. EUT DESCRIPTION

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

### 5.2. MAXIMUM FUNDAMENTAL FIELD STRENGTH

The transmitter has a maximum peak fundamental field strength as follows:

Frequency Range (MHz)	Mode	Peak E-field Strength (dBuV/m)	Avg E-field Strength (dBuV/m)	Distance (m)
2405 - 2475	ANT +	93.69	93.36	3.00

### 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**

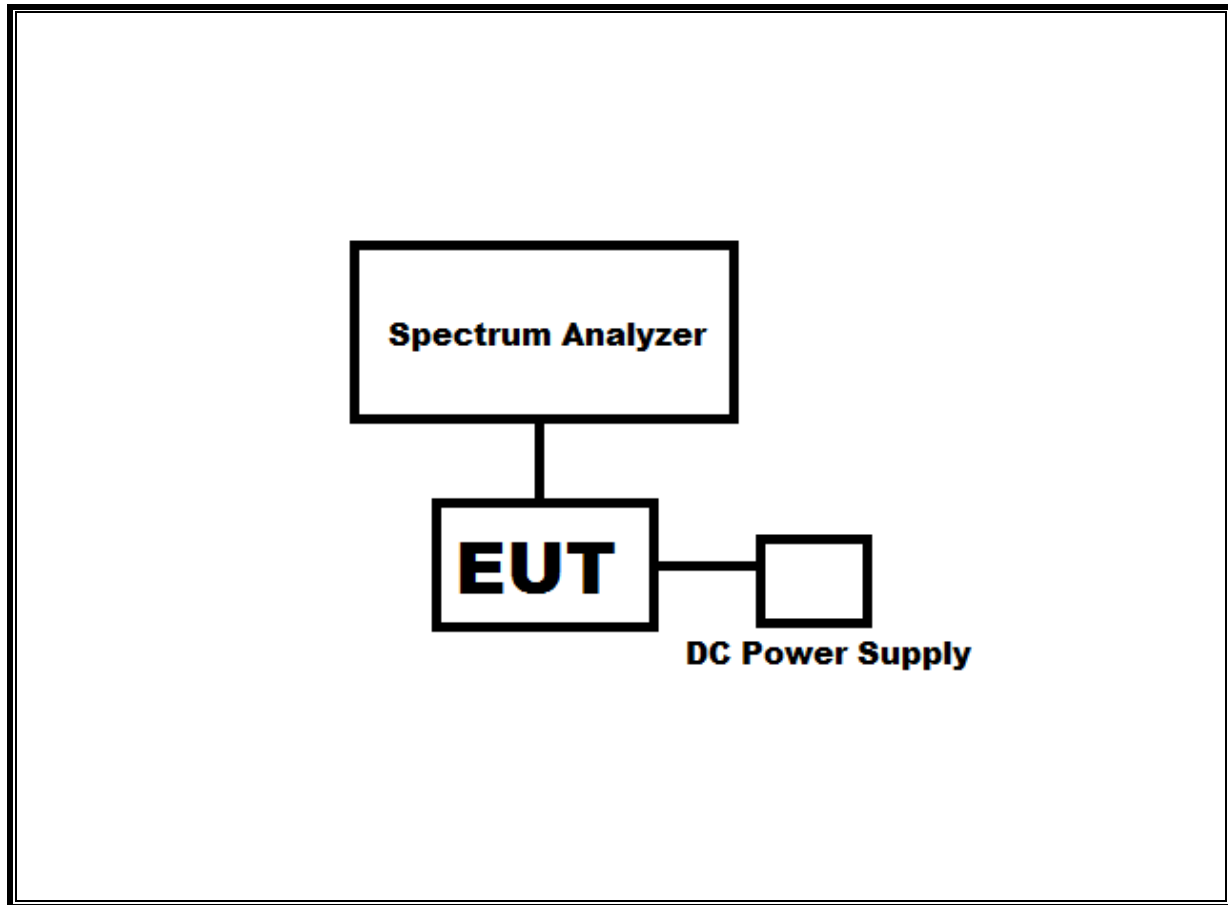
Support Equipment List			
Description	Manufacturer	Model	Serial Number
Ipod Touch	Apple	MKJ02LL/A	CCQVRHY2GGNL

### **TEST SETUP**

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

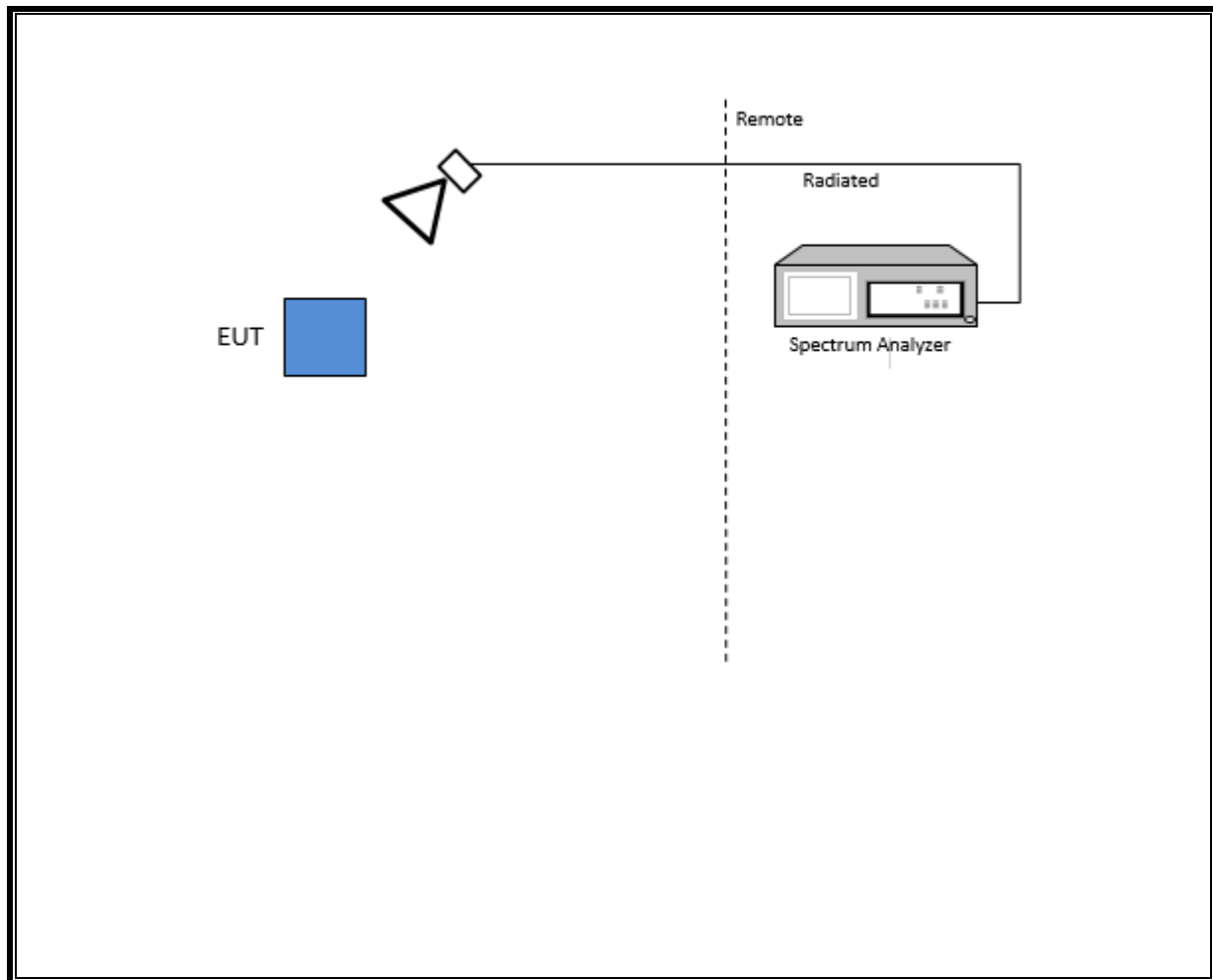


**SETUP DIAGRAM FOR CONDUCTED TESTS**



\*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

On Time and Duty Cycle: ANSI C63.10-2013 Section 11.6

Occupied BW (20dB): ANSI C63.10-2013 Section 6.9.2

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

Radiated Spurious Emissions 30-1000MHz: ANSI C63.10-2013 Section 6.3 and 6.5

Radiated Spurious Emissions above 1GHz: ANSI C63.10-2013 Section 6.3 and 6.6

Radiated Band-edge: ANSI C63.10-2013 Section 6.10.5

## 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 Num	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	T863	06/21/2019	06/21/2018
RF Amplifier, 1-18GHz	MITEQ	AFS42-00101800-25-S-42	T493	08/30/2019	08/30/2018
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
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent (Keysight) Technologies	N9030A	T1454	01/08/2019	01/08/2018

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.

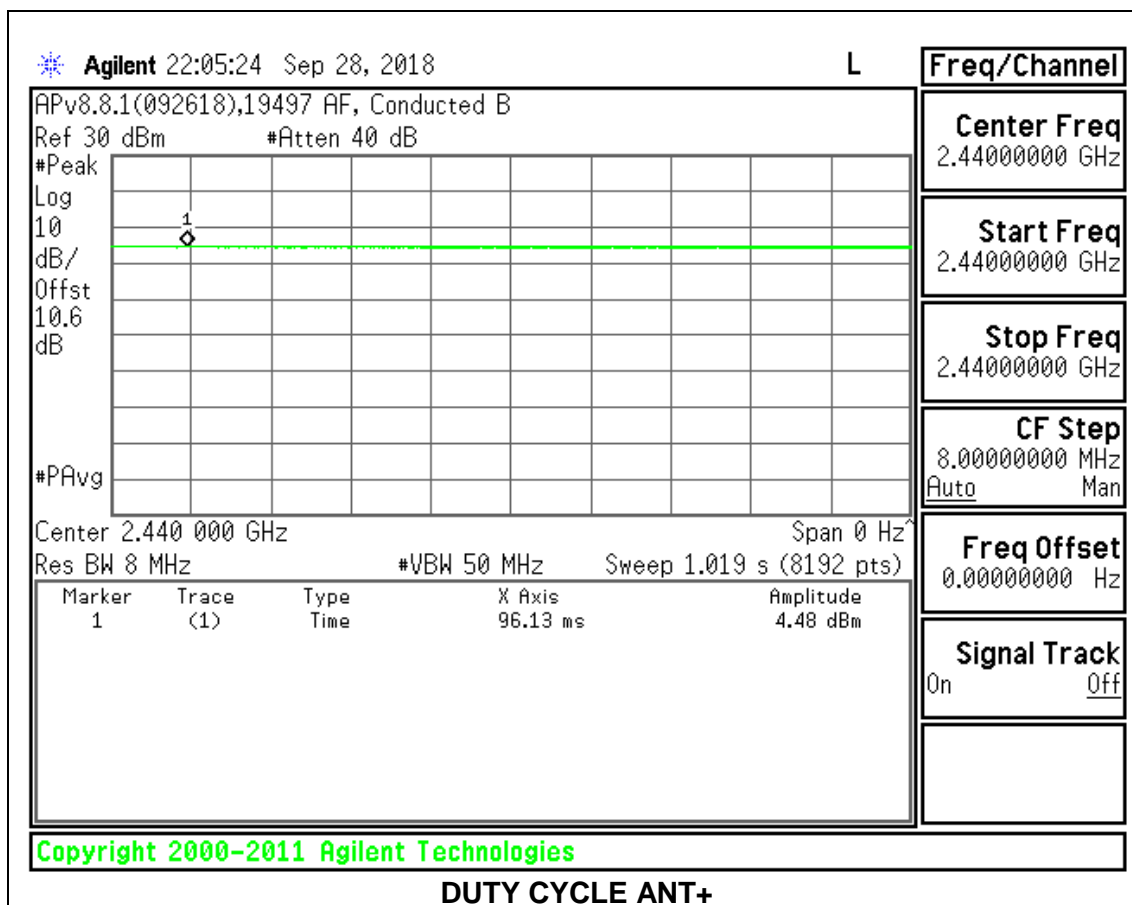
#### PROCEDURE

ANSI C63.10, Section 11.6 : 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)
2.4GHz Band						
ANT+	1.000	1.000	1.000	100.00%	0.00	0.010

## DUTY CYCLE PLOT



## 8.2. 99% BANDWIDTH

### LIMITS

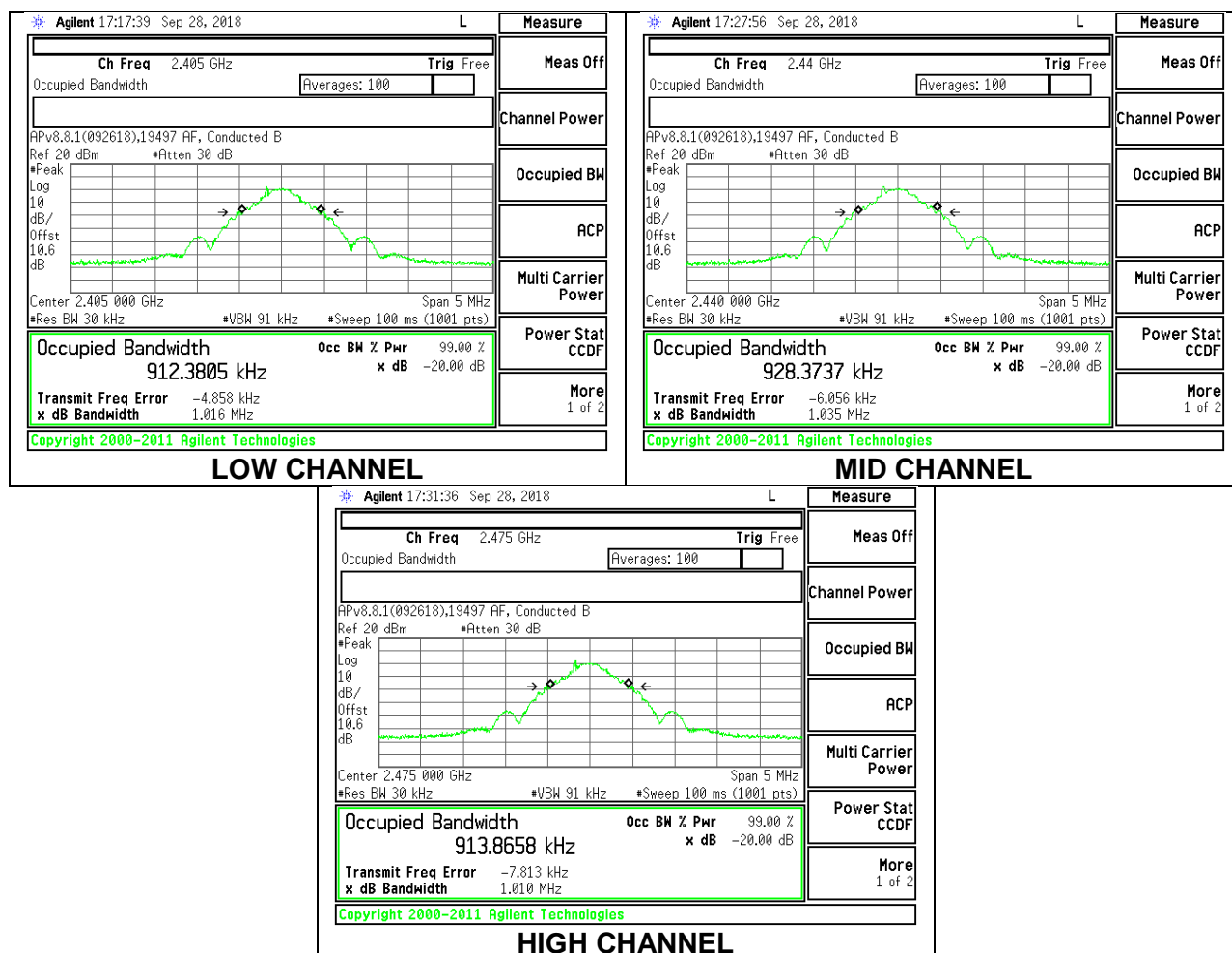
None; for reporting purposes only.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled.

### RESULTS

Channel	Frequency (MHz)	99% Bandwidth (kHz)
Low	2405	912.3805
Middle	2440	928.3737
High	2475	913.8658



### **8.3. 20 dB BANDWIDTH**

#### **LIMITS**

None; for reporting purposes only.

#### **TEST PROCEDURE**

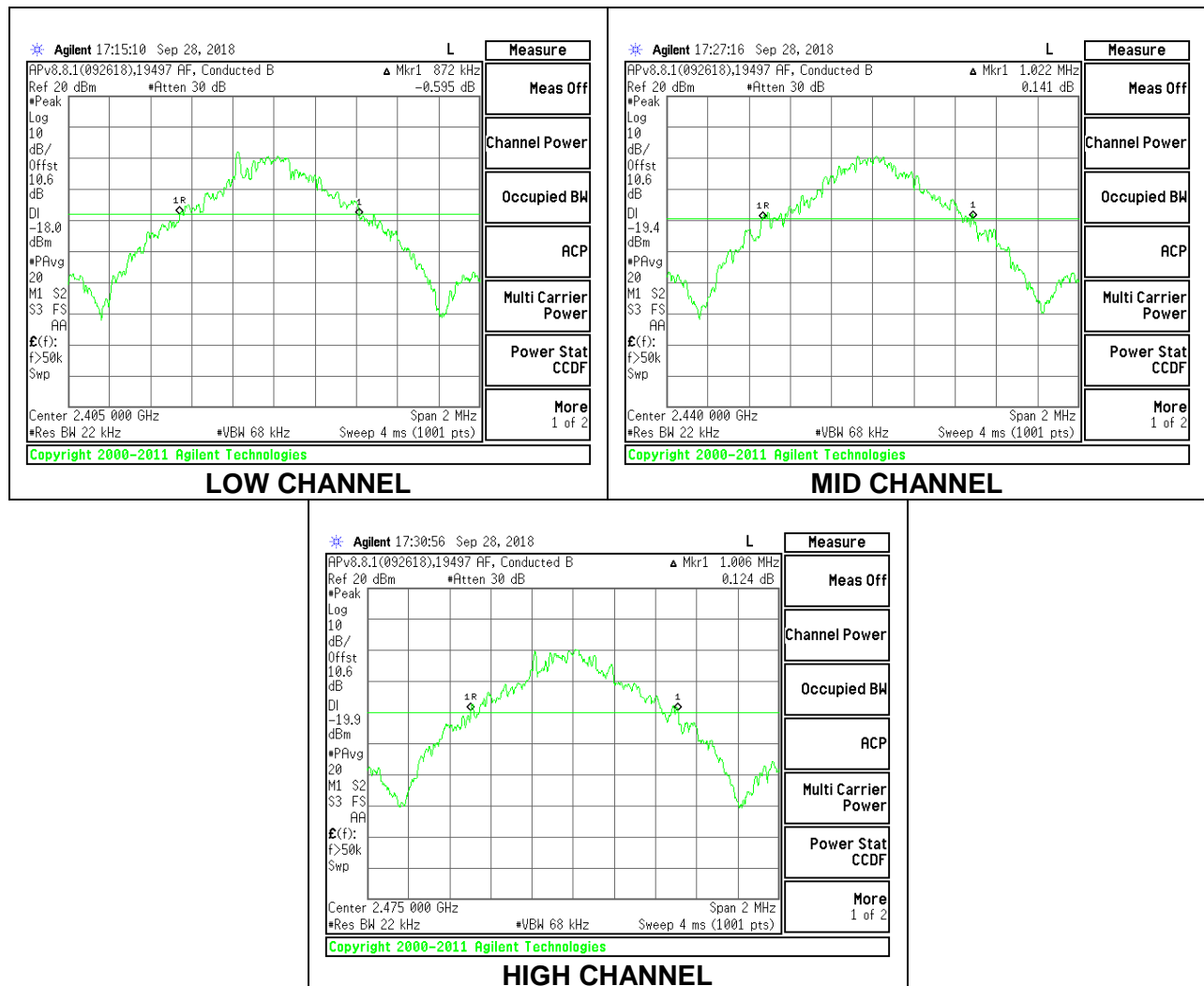
The transmitter output is connected to a spectrum analyzer. The RBW is set to  $\geq 1\%$  of the 20 dB bandwidth. The VBW is set to  $\geq$  RBW. The sweep time is coupled

#### **RESULTS**

Test table results for FCC Rule Part15.215(c): Compliant.

Channel	Frequency (MHz)	20dB Bandwidth (MHz)	Frequency Edge (MHz)	Limit (MHz)	Margin (MHz)
Low	2405	0.8720	2404.5640	2400	-4.56
Mid	2440	1.0220	N/A	N/A	N/A
High	2475	1.0060	2475.5030	2483.5	-8.00





## 9. RADIATED TEST RESULTS

### 9.1. LIMITS AND PROCEDURE

#### LIMITS

FCC 15.249

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHz, and 24.0–24.25 GHz.

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz .....	50	500
2400–2483.5 MHz .....	50	500
5725–5875 MHz .....	50	500
24.0–24.25 GHz .....	250	2500

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.

(e) As shown in Sec. 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490 .....	2400/F(kHz)	300
0.490–1.705 .....	24000/F(kHz)	30
1.705–30.0 .....	30	30
30–88 .....	100 **	3
88–216 .....	150 **	3
216–960 .....	200 **	3
Above 960 .....	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

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## **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.

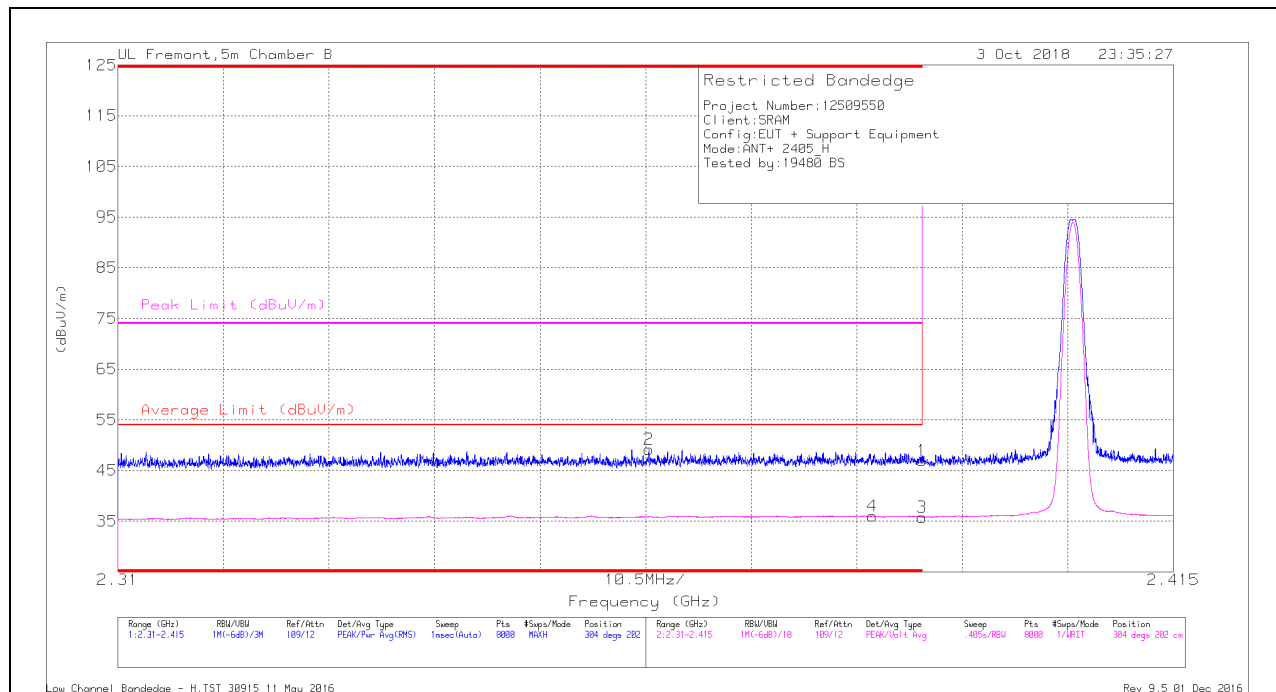
The spectrum from 1 GHz to 18 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band. Below 1GHz and above 18GHz emissions, the channel with the highest output power was tested.

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



#### Trace Markers

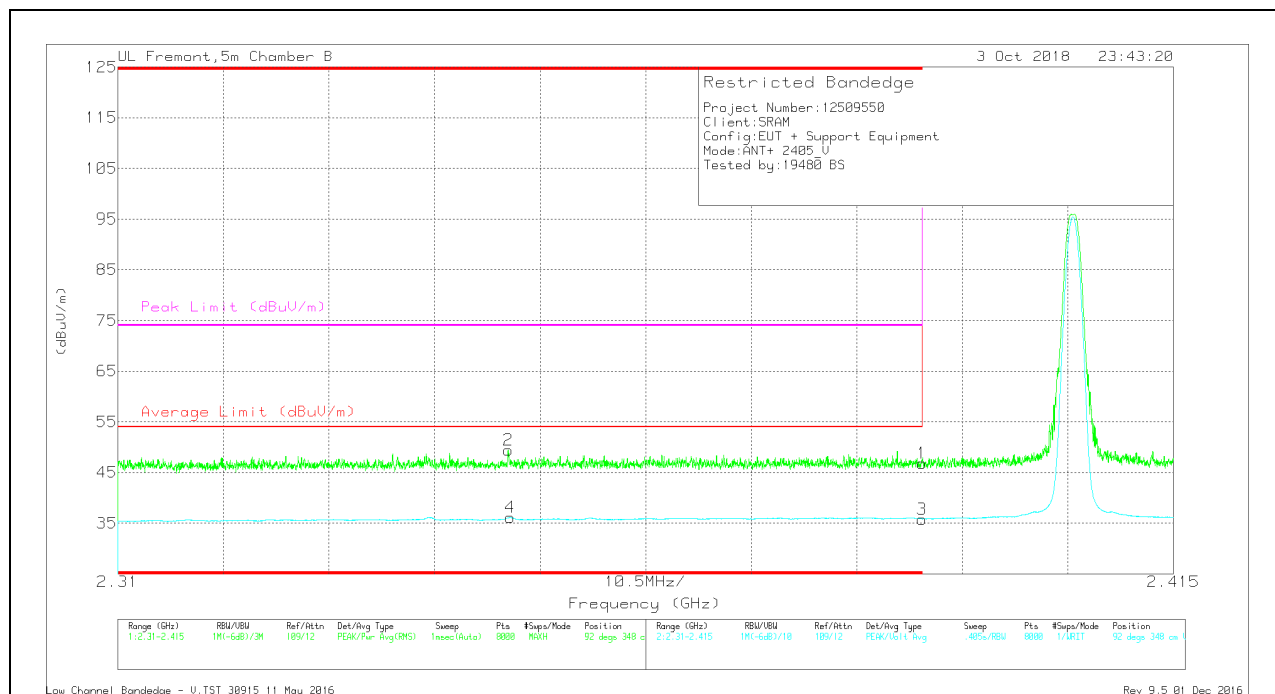
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	35.88	Pk	32.3	-21.2	46.98	-	-	74	-27.02	304	202	H
2	* 2.363	38.01	Pk	32.2	-21	49.21	-	-	74	-24.79	304	202	H
3	* 2.39	24.65	VA1T	32.3	-21.2	35.75	54	-18.25	-	-	304	202	H
4	* 2.385	24.74	VA1T	32.3	-21	36.04	54	-17.96	-	-	304	202	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## 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
2	* 2.349	38.25	Pk	32.2	-21	49.45	-	-	74	-24.55	92	348	V
4	* 2.349	24.99	VA1T	32.2	-21	36.19	54	-17.81	-	-	92	348	V
1	* 2.39	35.77	Pk	32.3	-21.2	46.87	-	-	74	-27.13	92	348	V
3	* 2.39	24.71	VA1T	32.3	-21.2	35.81	54	-18.19	-	-	92	348	V

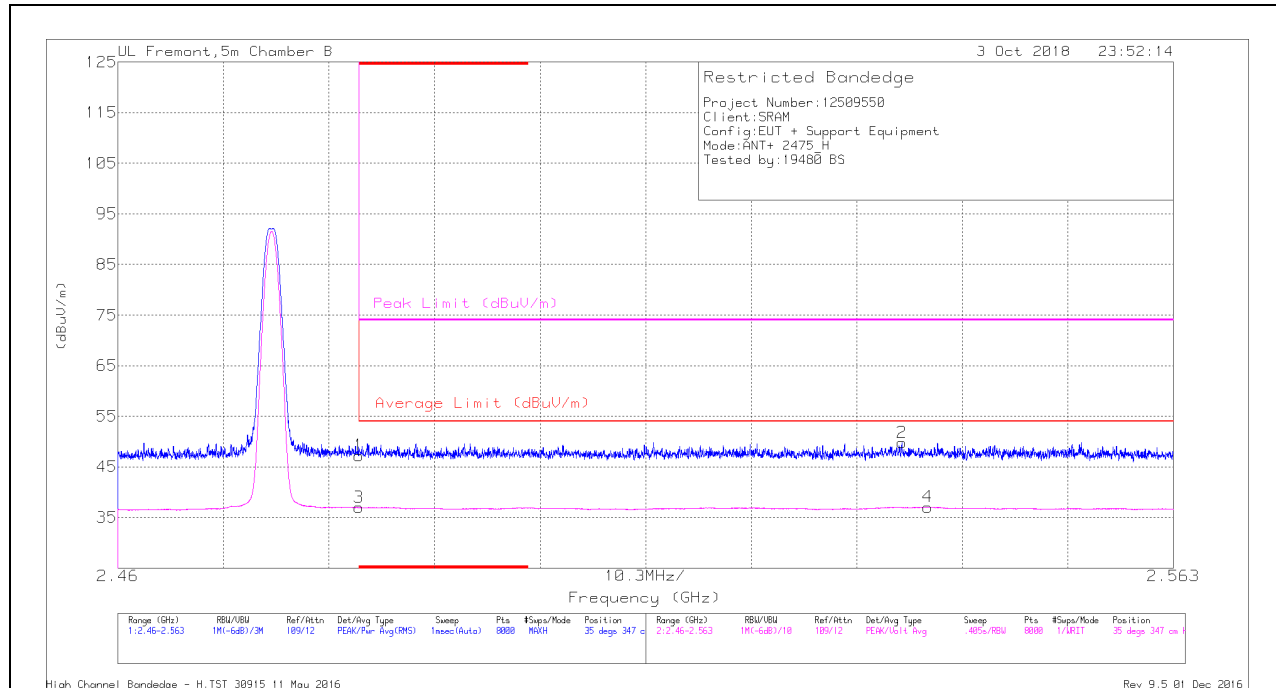
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $VB=1/Ton$  where: Ton is transmit duration

# BANDEDGE (HIGH CHANNEL)

## HORIZONTAL RESULT



## Trace Markers

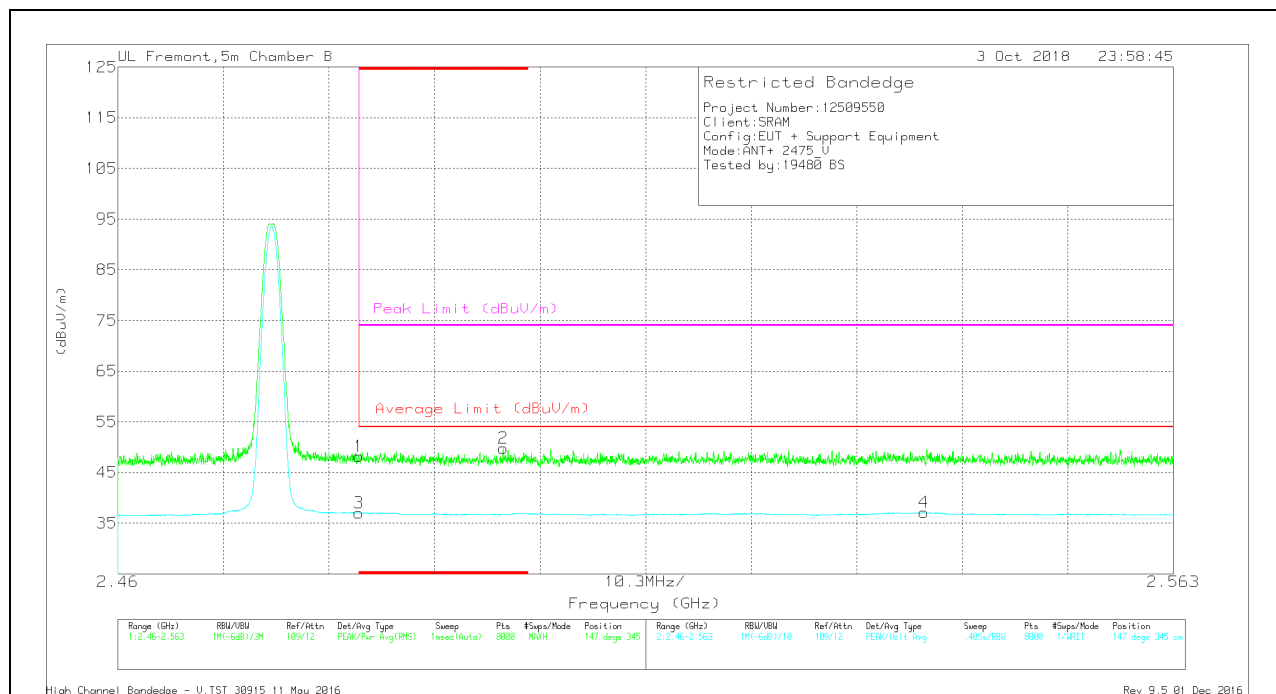
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.484	35.35	Pk	32.6	-20.7	47.25	-	-	74	-26.75	35	347	H
3	* 2.484	25.05	VA1T	32.6	-20.7	36.95	54	-17.05	-	-	35	347	H
2	2.537	37.71	Pk	32.7	-20.6	49.81	-	-	74	-24.19	35	347	H
4	2.539	24.97	VA1T	32.7	-20.6	37.07	54	-16.93	-	-	35	347	H

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

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## 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	36.29	Pk	32.6	-20.7	48.19	-	-	74	-25.81	147	345	V
2	* 2.498	38.02	Pk	32.7	-20.9	49.82	-	-	74	-24.18	147	345	V
3	* 2.484	25.08	VA1T	32.6	-20.7	36.98	54	-17.02	-	-	147	345	V
4	2.539	24.99	VA1T	32.7	-20.6	37.09	54	-16.91	-	-	147	345	V

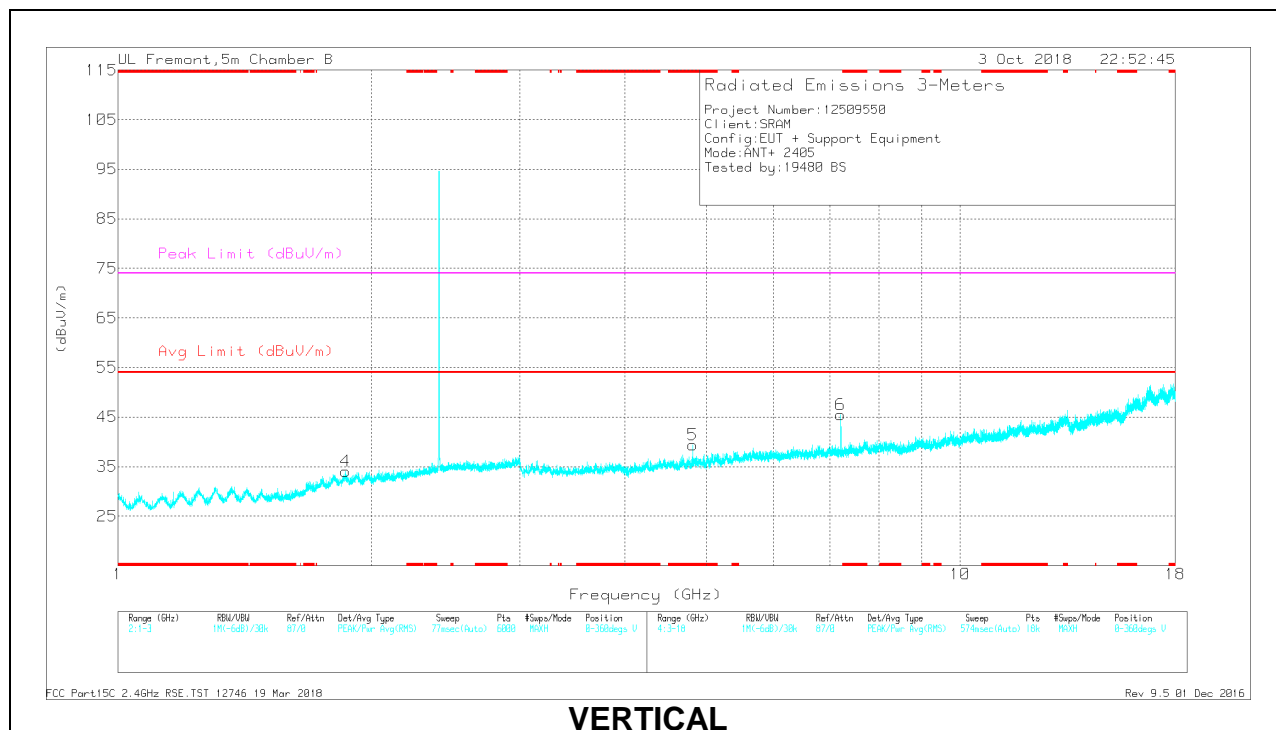
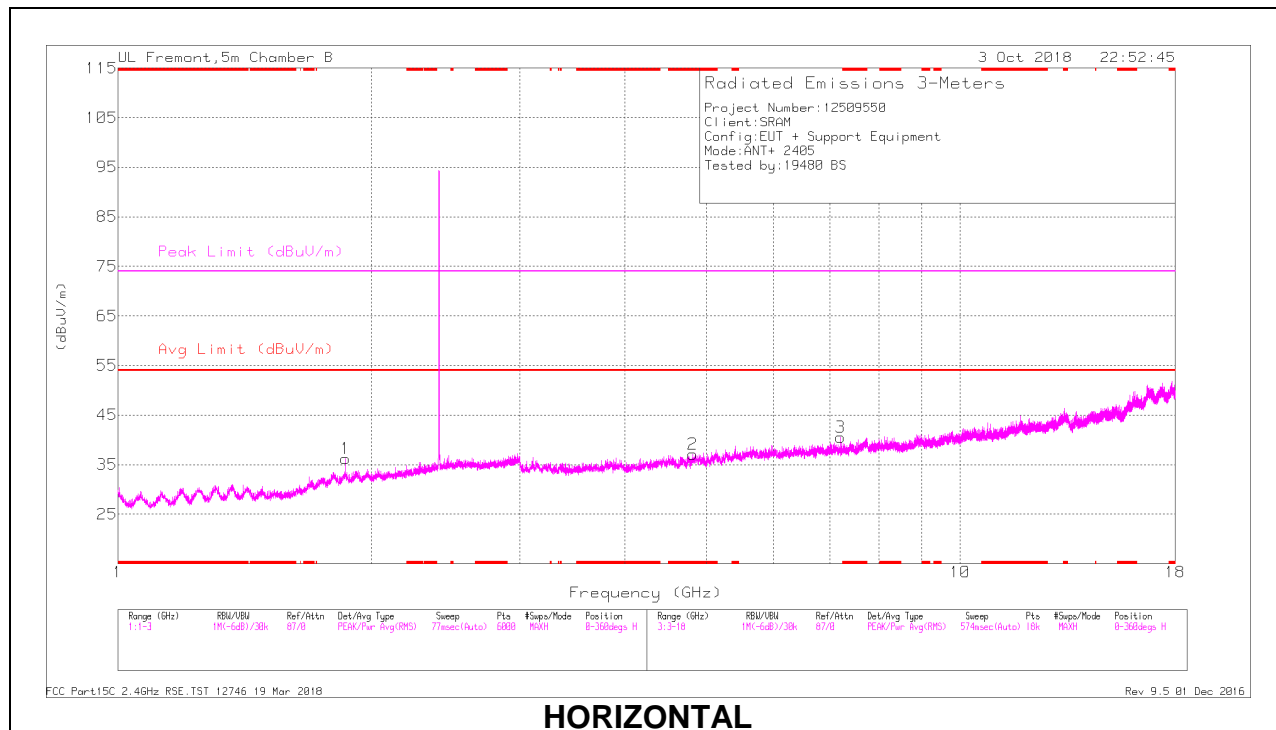
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

VA1T - FHSS: Linear Voltage Average  $VB=1/Ton$  where: Ton is transmit duration

## HARMONICS AND SPURIOUS EMISSIONS

### LOW CHANNEL RESULTS





## RADIATED EMISSIONS

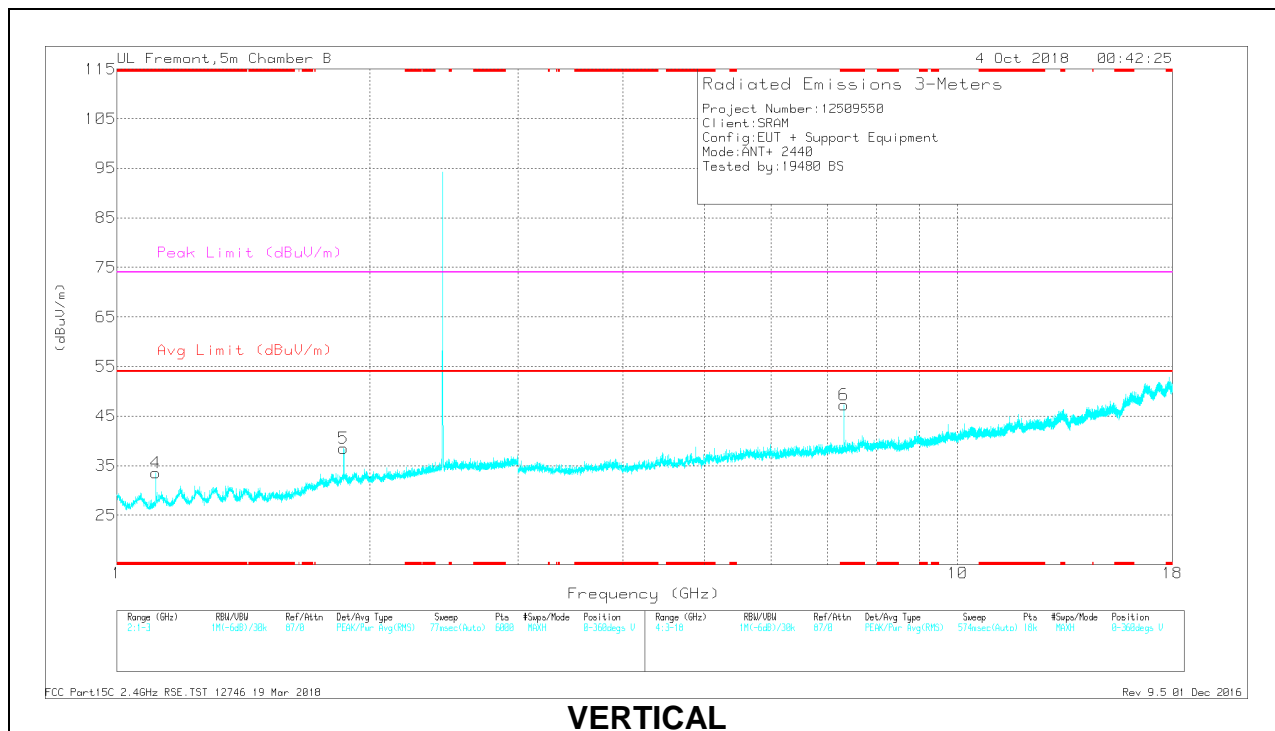
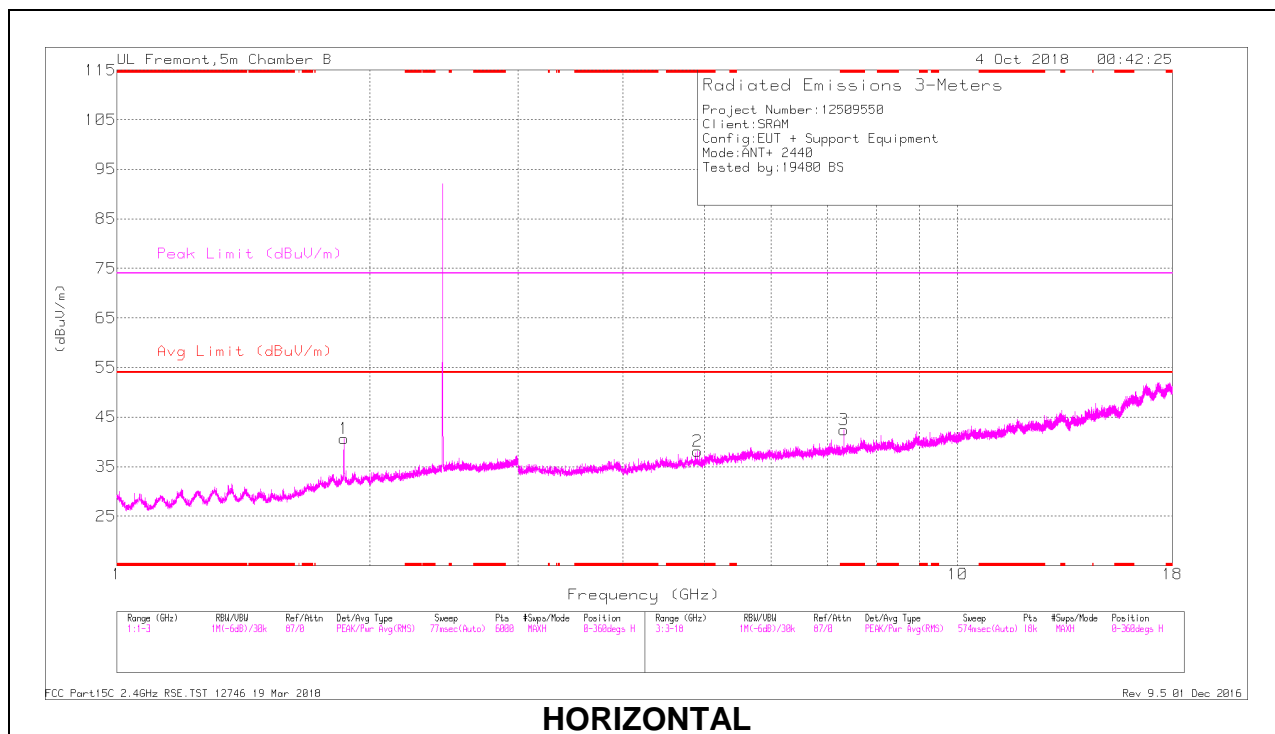
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 4.811	37.6	PKFH	34.1	-29.4	42.3	-	-	74	-31.7	302	137	H
	* 4.81	27.15	VA1T	34.1	-29.4	31.85	54	-22.15	-	-	302	137	H
5	* 4.81	41.05	PKFH	34.1	-29.5	45.65	-	-	74	-28.35	131	172	V
	* 4.81	33.4	VA1T	34.1	-29.4	38.1	54	-15.9	-	-	131	172	V
1	1.862	28.03	PKFH	30.9	-21	37.93	-	-	-	-	121	291	H
	1.862	19.05	VA1T	30.9	-21	28.95	-	-	-	-	121	291	H
4	1.864	28.34	PKFH	30.9	-20.9	38.34	-	-	-	-	71	351	V
	1.864	29.37	VA1T	30.9	-20.9	27.37	-	-	-	-	71	351	V
6	7.215	41.85	PKFH	35.9	-27.6	50.15	-	-	-	-	111	102	V
	7.215	31.9	VA1T	35.9	-27.6	40.2	-	-	-	-	111	102	V
3	7.216	37.8	PKFH	35.9	-27.6	46.1	-	-	-	-	34	370	H
	7.216	28.88	VA1T	35.9	-27.6	37.18	-	-	-	-	34	370	H

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## MID CHANNEL RESULTS



## RADIATED EMISSIONS

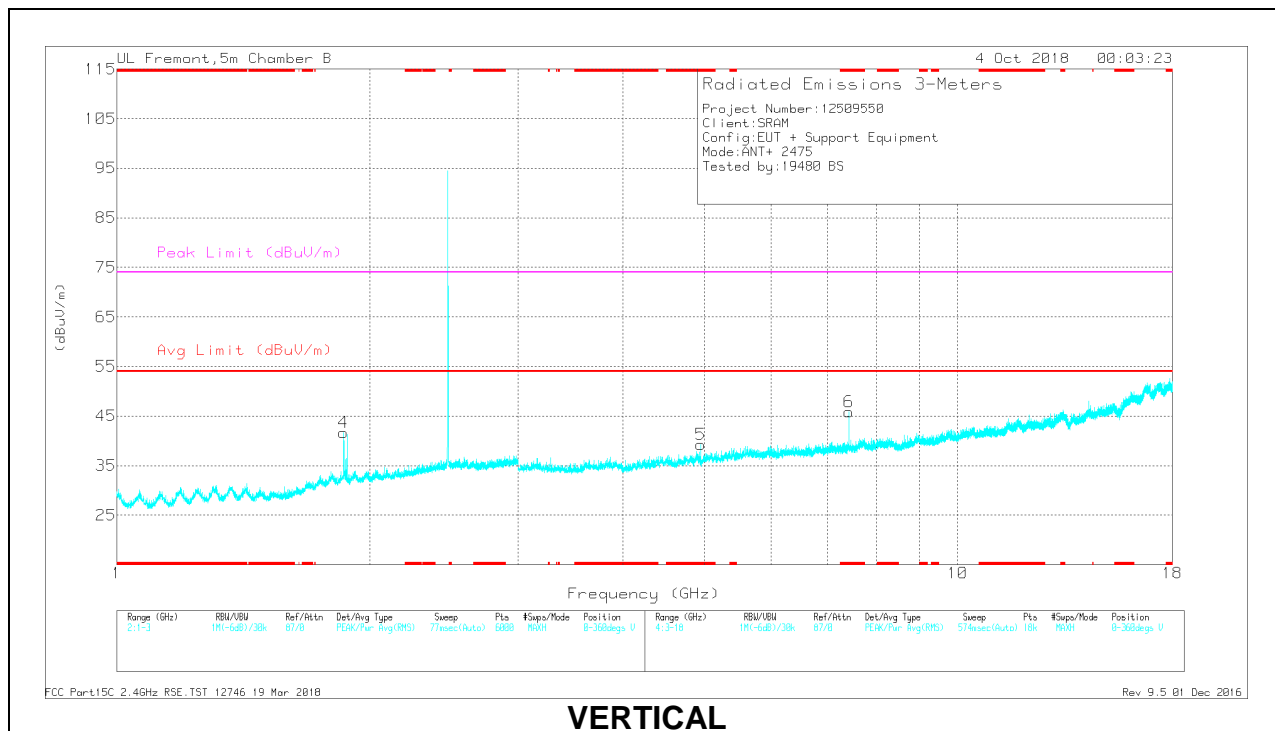
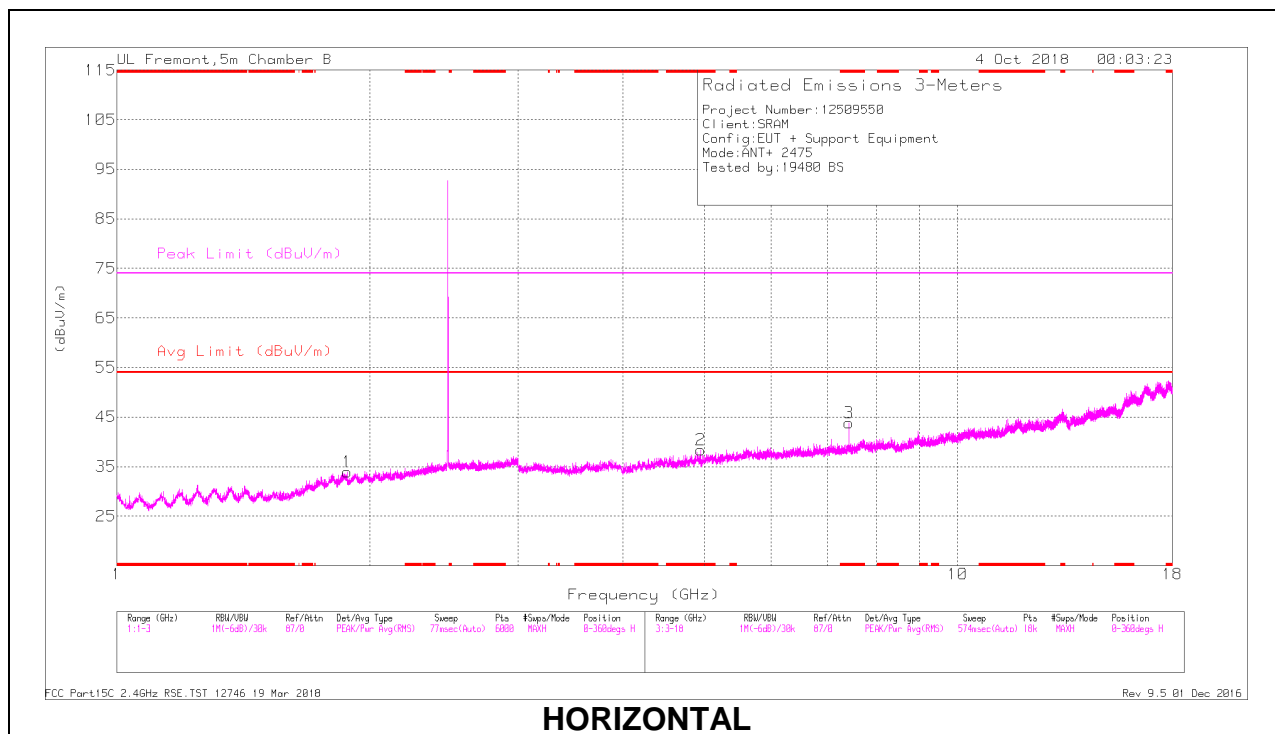
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	* 1.114	29	PKFH	27.4	-22.9	33.5	-	-	74	-40.5	183	386	V
	* 1.114	17.24	VA1T	27.4	-22.9	21.74	54	-32.26	-	-	183	386	V
2	* 4.909	38.54	PKFH	34.4	-30.6	42.34	-	-	74	-31.66	201	387	H
	* 4.908	27.25	VA1T	34.4	-30.6	31.05	54	-22.95	-	-	201	387	H
3	* 7.32	37.64	PKFH	35.9	-27.9	45.64	-	-	74	-28.36	54	385	H
	* 7.32	27.27	VA1T	35.9	-27.9	35.27	54	-18.73	-	-	54	385	H
6	* 7.32	43.15	PKFH	35.9	-27.9	51.15	-	-	74	-22.85	106	102	V
	* 7.32	35.82	VA1T	35.9	-27.9	43.82	54	-10.18	-	-	106	102	V
5	1.861	28.22	PKFH	30.9	-21	38.12	-	-	-	-	57	385	H
	1.861	16.72	VA1T	30.9	-21	26.62	-	-	-	-	57	385	H
1	1.863	28.33	PKFH	30.9	-21	38.23	-	-	-	-	187	136	V
	1.863	16.81	VA1T	30.9	-21	26.71	-	-	-	-	187	136	V

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## HIGH CHANNEL RESULTS



## RADIATED EMISSIONS

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	AF T863 (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	* 4.949	39.36	PKFH	34.5	-30.1	43.76	-	-	74	-30.24	48	192	H
	* 4.95	30.68	VA1T	34.5	-30	35.18	54	-18.82	-	-	48	192	H
3	* 7.425	39.44	PKFH	36.2	-26.7	48.94	-	-	74	-25.06	281	208	H
	* 7.425	29.9	VA1T	36.2	-26.7	39.4	54	-14.6	-	-	281	208	H
5	* 4.949	39.73	PKFH	34.5	-30.1	44.13	-	-	74	-29.87	126	261	V
	* 4.95	31.68	VA1T	34.5	-30	36.18	54	-17.82	-	-	126	261	V
6	* 7.424	39.8	PKFH	36.2	-26.7	49.3	-	-	74	-24.7	52	158	V
	* 7.425	32.13	VA1T	36.2	-26.7	41.63	54	-12.37	-	-	52	158	V
4	1.86	16.75	VA1T	30.9	-21	26.65	-	-	-	-	277	211	V
	1.861	28.06	PKFH	30.9	-21	37.96	-	-	-	-	277	211	V
1	1.877	16.12	VA1T	31	-21	26.12	-	-	-	-	98	159	H
	1.878	27.77	PKFH	31	-21	37.77	-	-	-	-	98	159	H

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

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

### 9.3. FUNDAMENTAL FREQUENCY RADIATED EMISSION

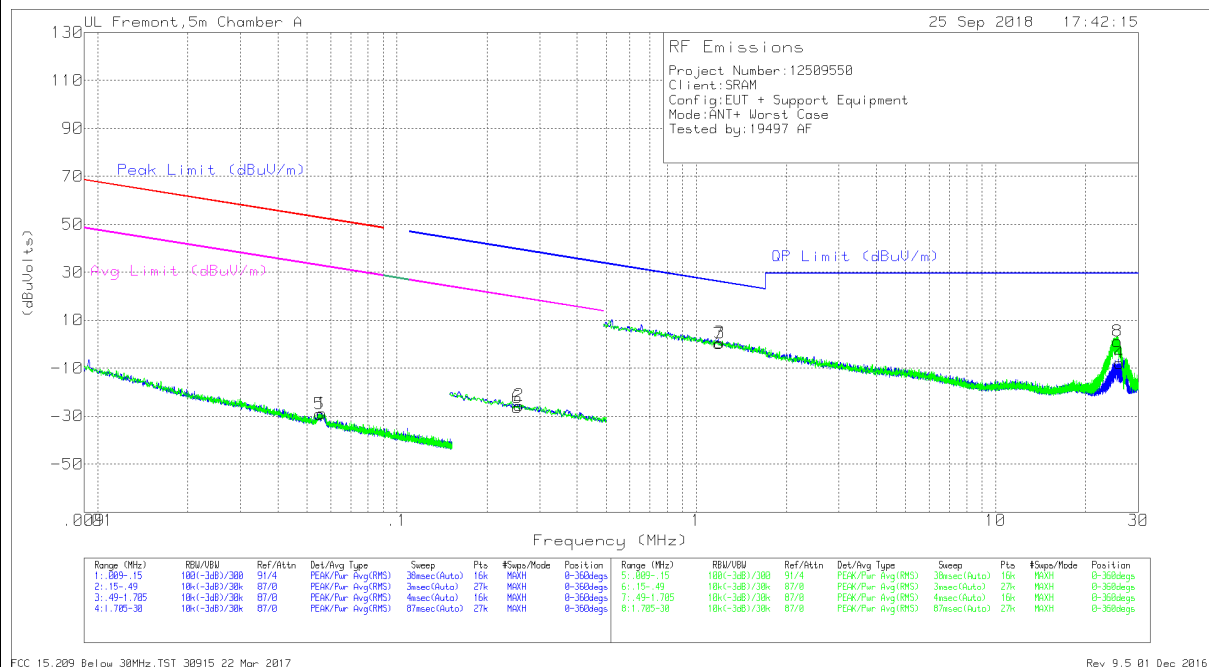
Frequency (GHz)	Meter Reading (dBuV)	Det	AF T345 (dB/m)	Amp/Cbl/Filtr/Pad (dB)	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2.405	84.79	PKFH	31.9	-23	93.69	-	-	114	-20.31	166	117	H
	84.36	VA1T	31.9	-22.9	93.36	94	-0.64	-	-	166	117	H
	82.31	PKFH	31.9	-23	91.21	-	-	114	-22.79	210	201	V
	81.85	VA1T	31.9	-22.9	90.85	94	-3.15	-	-	210	201	V
2.44	83.53	PKFH	32.1	-22.9	92.73	-	-	114	-21.27	165	102	H
	83.18	VA1T	32.1	-22.9	92.38	94	-1.62	-	-	165	102	H
	81.7	PKFH	32.1	-22.9	90.9	-	-	114	-23.1	196	198	V
	81.54	VA1T	32.1	-22.9	90.74	94	-3.26	-	-	196	198	V
2.475	82.75	PKFH	32.3	-22.9	92.15	-	-	114	-21.85	165	127	H
	82.3	VA1T	32.3	-22.9	91.7	94	-2.3	-	-	165	127	H
	82.3	PKFH	32.3	-22.9	91.7	-	-	114	-22.3	67	203	V
	81.86	VA1T	32.3	-22.9	91.26	94	-2.74	-	-	67	203	V

PKFH - FHSS: RB=100k/1MHz VB=3 x RB, Peak

VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

## 9.4. Worst Case Below 30MHz

### FACE ON AND FACE OFF PLOTS



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

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

### Below 30MHz DATA

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 300m	Corrected Reading (dBuVolts)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
5	.05507	38.97	Pk	11.8	.1	-80	-29.13	52.77	-81.9	32.77	-61.9	-	-	-	-	0-360
1	.05615	39.34	Pk	11.8	.1	-80	-28.76	52.6	-81.36	32.6	-61.36	-	-	-	-	0-360
6	.25233	42.61	Pk	10.9	.1	-80	-26.39	-	-	-	-	39.58	-65.97	19.58	-45.97	0-360
2	.25613	43.44	Pk	10.9	.1	-80	-25.56	-	-	-	-	39.45	-65.01	19.45	-45.01	0-360

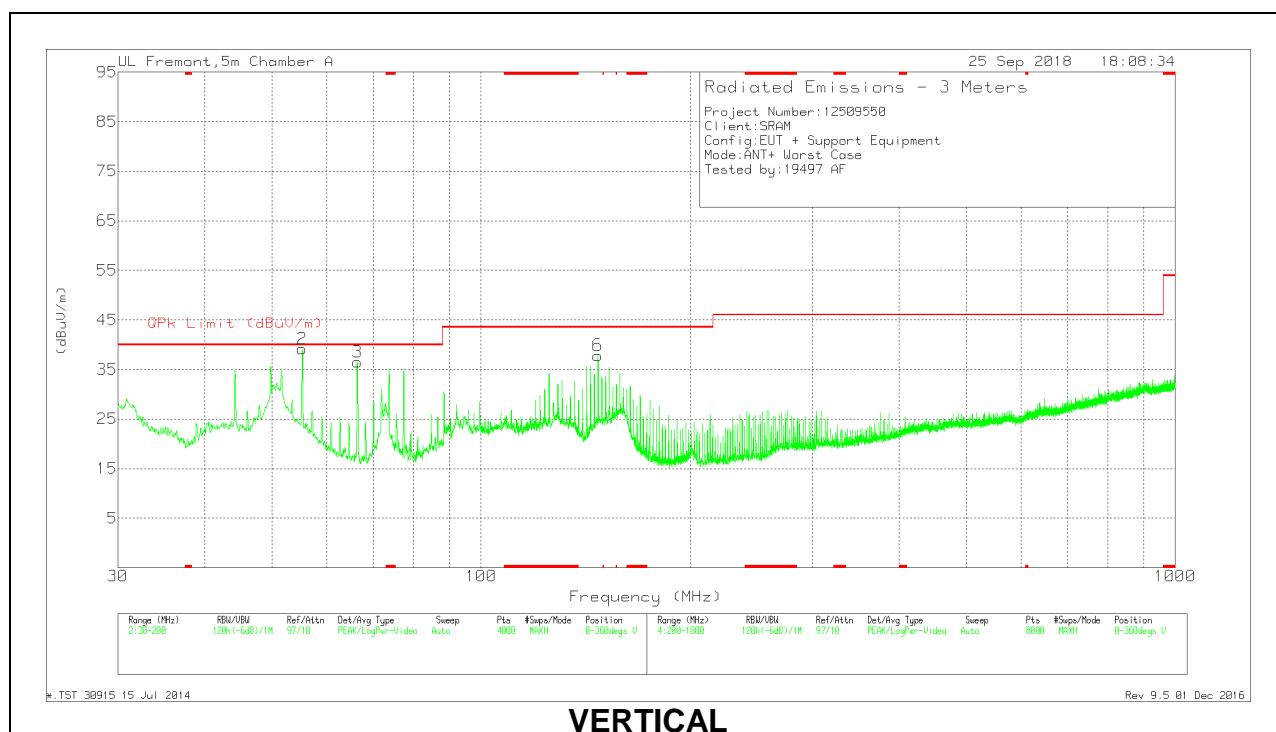
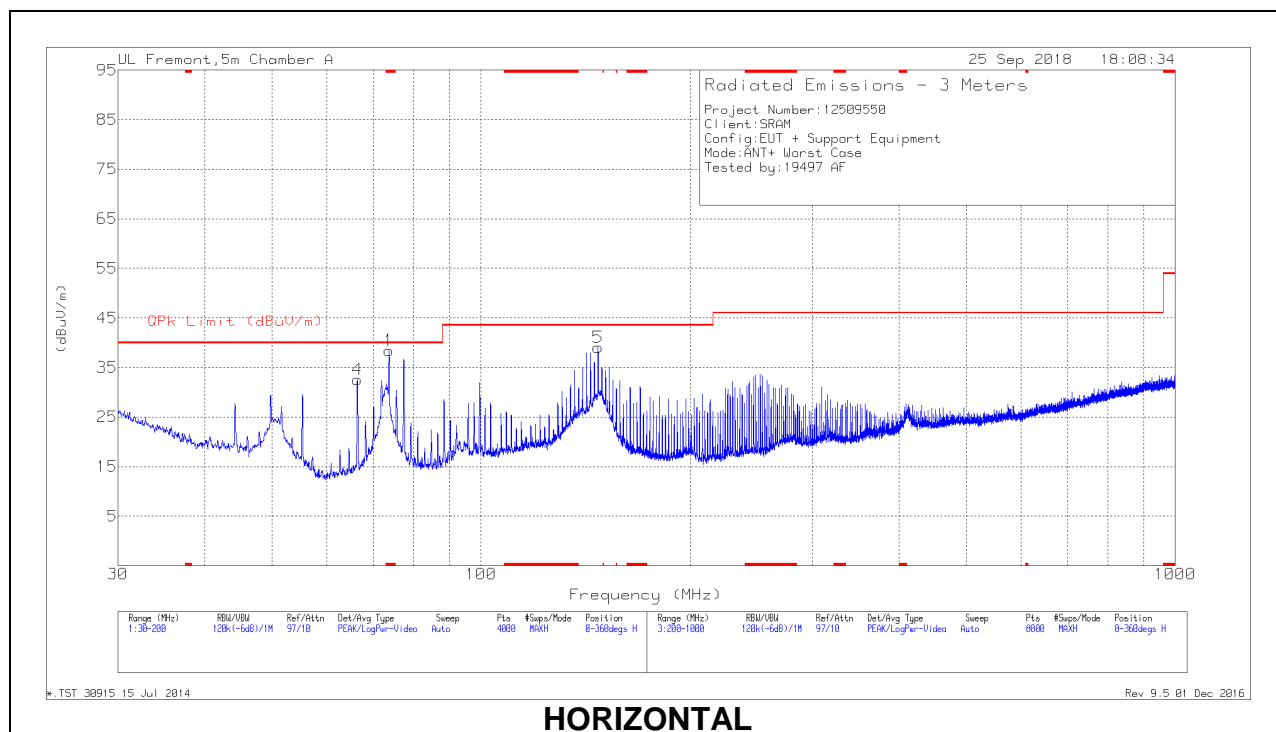
### Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cbl (dB)	Dist Corr 30m	Corrected Reading (dBuVolts)	QP Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
7	1.18943	28.69	Pk	11.3	.2	-40	.19	26.12	-25.93	-	-	-	-	0-360
3	1.19805	29.09	Pk	11.3	.2	-40	.59	26.06	-25.47	-	-	-	-	0-360
8	25.55643	30.17	Pk	10.3	.7	-40	1.17	29.5	-28.33	-	-	-	-	0-360
4	25.93686	21.15	Pk	10.2	.7	-40	-7.95	29.5	-37.45	-	-	-	-	0-360

### Pk - Peak detector

## 9.5. 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
1	* 73.7066	50.23	Qp	12	-26.7	35.53	40	-4.47	8	231	H
2	55.2916	54.3	Qp	11.1	-26.9	38.5	40	-1.5	247	111	V
4	66.3469	47.25	Pk	12.1	-26.8	32.55	40	-7.45	0-360	300	H
3	66.3426	50.79	Qp	12.1	-26.8	36.09	40	-3.91	222	101	V
5	147.4435	46.94	Qp	16.6	-25.9	37.64	43.52	-5.88	247	208	H
6	147.4562	46.19	Qp	16.6	-25.9	36.89	43.52	-6.63	12	102	V

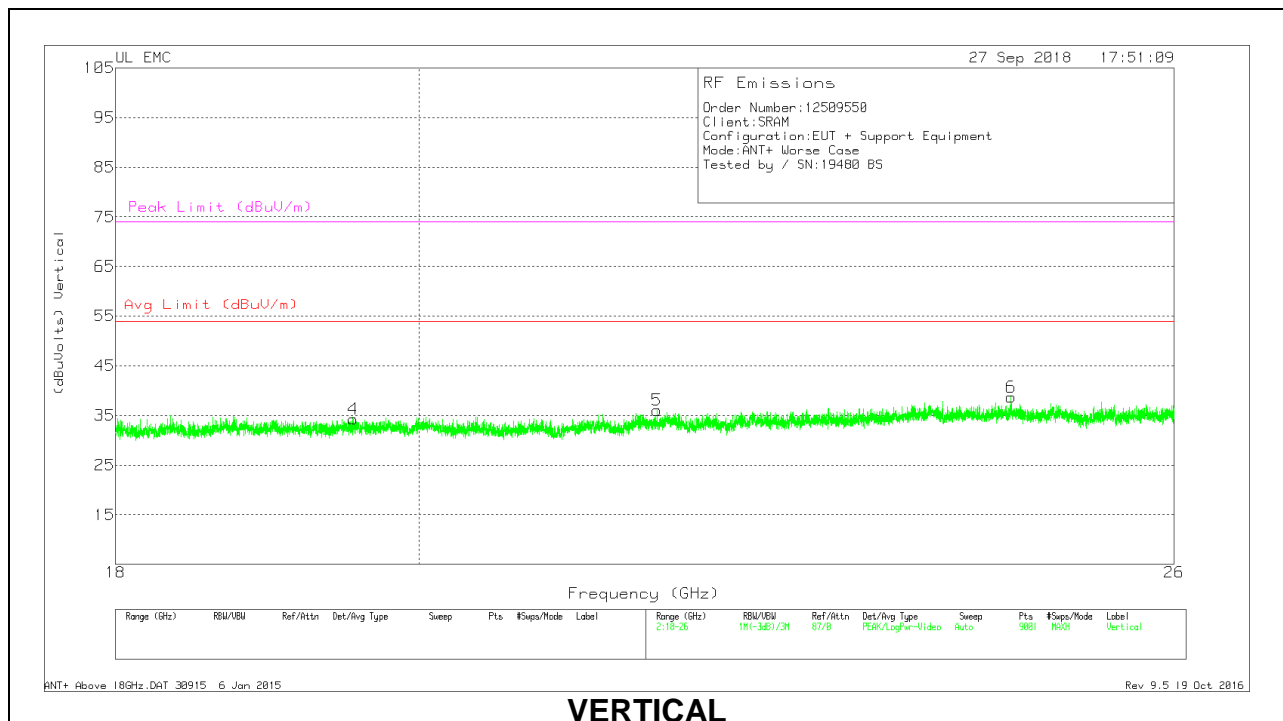
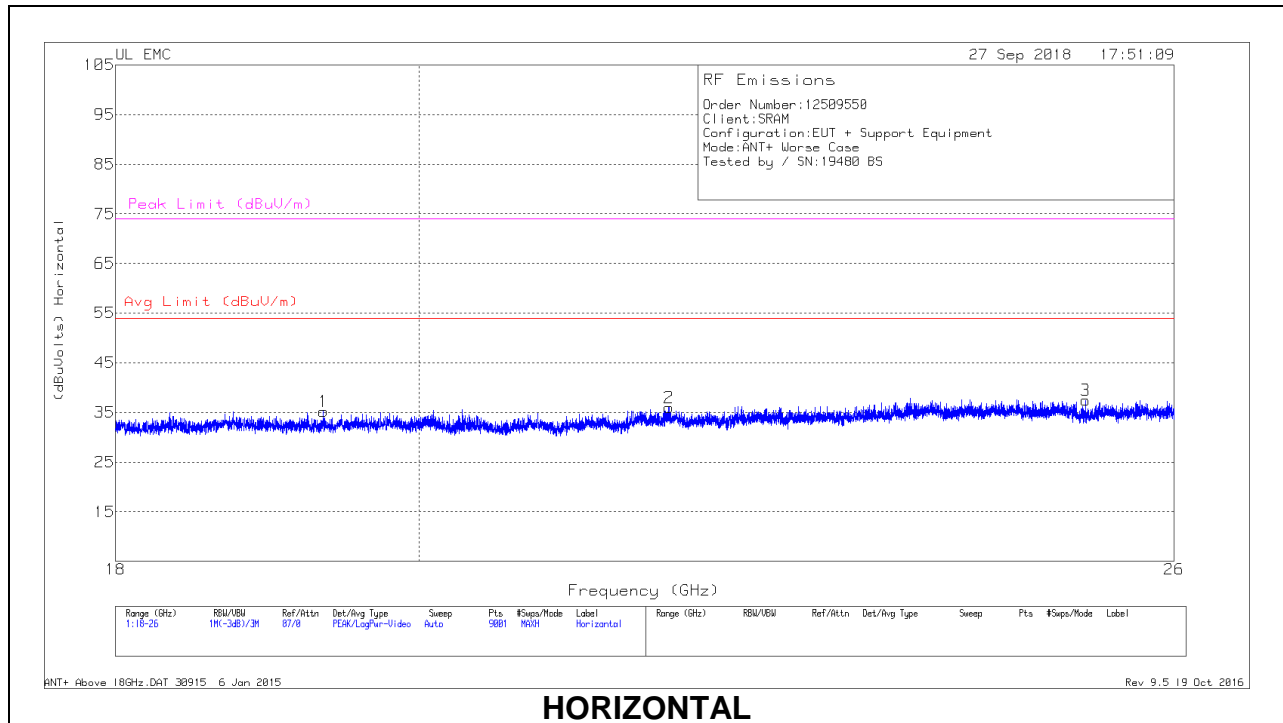
\* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band

Pk - Peak detector

Qp - Quasi-Peak detector

## 9.6. 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	19.348	37.03	Pk	32.4	-24.7	-9.5	35.23	54	-18.77	74	-38.77
2	21.815	36.69	Pk	33.3	-24.5	-9.5	35.99	54	-18.01	74	-38.01
3	25.212	38.72	Pk	33.6	-25.4	-9.5	37.42	54	-16.58	74	-36.58
4	19.55	36.35	Pk	32.5	-25.1	-9.5	34.25	54	-19.75	74	-39.75
5	21.724	37.14	Pk	33.3	-24.9	-9.5	36.04	54	-17.96	74	-37.96
6	24.567	38.23	Pk	33.9	-23.9	-9.5	38.73	54	-15.27	74	-35.27

Pk - Peak detector