



FCC CFR 47 PART 15 SUBPART F §15.519

**CERTIFICATION TEST REPORT**

**FOR**

**WORKFORCE CONTACT TRACING BADGE**

**MODEL NUMBER: PariRange P9215**

**REPORT NUMBER: 13428218-E4V2**

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**FCC ID: 2AXZZ-PARIRANGE9215**

*Prepared for*

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Revision History

Rev.	Issue Date	Revisions	Revised By
V1	01/06/2021	Initial Issue	Michael Heckrotte
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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** Embedtek LLC  
N7W23700 Bluemound Rd., Suite 100  
Waukesha, WI, 53188, U.S.A.

**EUT DESCRIPTION:** Workforce Contact Tracing Badge

**MODEL:** PariRange P9215

**SERIAL NUMBER:** 568bea41, 0650c18b

**DATE TESTED:** November 9 – 13, 2020

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC §15 Subpart F	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, or any agency of the Federal Government.

Approved & Released For  
UL Verification Services Inc. By:



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MICHAEL HECKROTTE  
PRINCIPAL ENGINEER  
UL Verification Services Inc.

Tested By:



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GIA-PIAO CHIN  
SENIOR TEST ENGINEER  
UL Verification Services Inc.

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with CFR Title 47 Part 15 Subpart F, KDB 393764 D01 UWB FAQ v02 and ANSI C63.10-2013.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA and at 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies the locations of the facilities that were utilized for radiated emission measurements documented in this report. The specific facilities used are identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Rd
<input type="checkbox"/> Chamber A	<input type="checkbox"/> Chamber D	<input type="checkbox"/> Chamber I
<input type="checkbox"/> Chamber B	<input type="checkbox"/> Chamber E	<input type="checkbox"/> Chamber J
<input type="checkbox"/> Chamber C	<input checked="" type="checkbox"/> Chamber F	<input type="checkbox"/> Chamber K
	<input type="checkbox"/> Chamber G	<input type="checkbox"/> Chamber L
	<input type="checkbox"/> Chamber H	<input type="checkbox"/> Chamber M

The above test sites and facilities are covered under FCC Test Firm Registration # 208313.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

## 4. DECISION RULES AND MEASUREMENT UNCERTAINTY

### 4.1. METROLOGICAL TRACEABILITY

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, with a maximum time between calibrations of one year or the manufacturers' recommendation, whichever is less, and where applicable is traceable to recognized national standards.

### 4.2. DECISION RULES

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4:2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.)

### 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	U <sub>LAB</sub>
Worst Case Conducted Disturbance, 9 kHz to 0.15 MHz	3.39 dB
Worst Case Conducted Disturbance, 0.15 to 30 MHz	3.07 dB
Worst Case Radiated Disturbance, 9 kHz to 30 MHz	2.52 dB
Worst Case Radiated Disturbance, 30 to 1000 MHz	4.88 dB
Worst Case Radiated Disturbance, 1000 to 18000 MHz	4.24 dB
Worst Case Radiated Disturbance, 18000 to 26000 MHz	4.37 dB
Worst Case Radiated Disturbance, 26000 to 40000 MHz	5.17 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is a UWB portable workforce contact tracing badge with an integral antenna and operates on 3494.4 MHz (Channel 1) and 3993.6 MHz (Channel 4). The EUT is powered by a 3.7 VDC battery.

### 5.2. DESCRIPTION OF AVAILABLE ANTENNAS

One dielectric chip antenna, Partron ACS5200HFAUWB, is employed and the antenna gains of each channel are listed as follow:

CH	Freq. Band (MHz)	Antenna Gain (dBi)
1	3494.4	12.5
4	3993.6	16

### 5.3. MODULATION

The UWB signal is BPM/BPSK modulated signal.

### 5.4. SOFTWARE AND FIRMWARE

The firmware versions used at test are parirange-55ba6a04511a-smarten0-txpower0x45-testbootloader.bin for Channel 1 and parirange-cert-90a679a5e66e.bin for Channel 4.

## 6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT (FOR SETUP PURPOSE ONLY)

Use	Product Type	Manufacturer	Model	Comments
AE	Laptop	Lenovo	T460S	note: UL Support Laptop 7
AE	AC-DC Adapter	Lenovo	ADLX45DLC2A	note: EMC Auto 6
Note: <b>EUT</b> - Equipment Under Test, <b>AE</b> - Auxiliary/Associated Equipment, or <b>SIM</b> - Simulator (Not Subjected to Test)				

### I/O CABLES

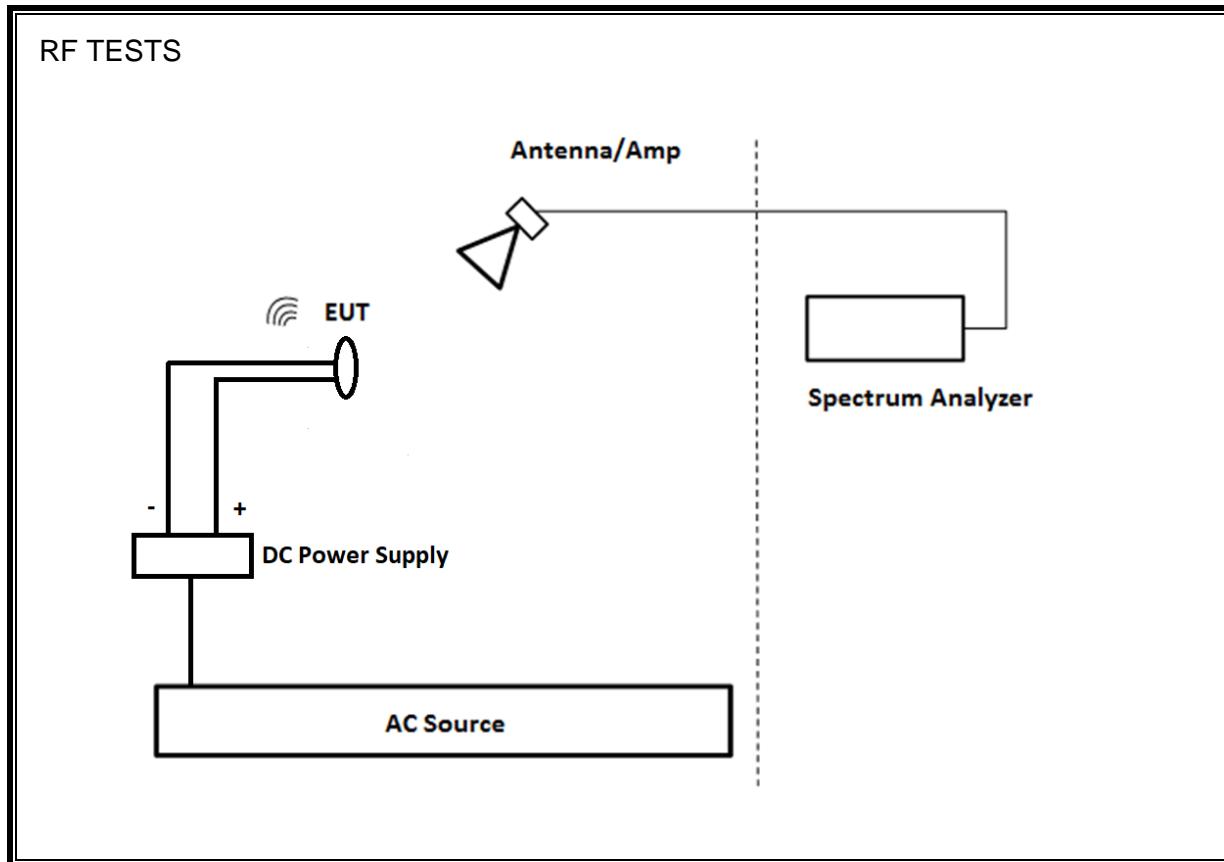
EUT is tested with no peripherals attached.

### TEST SETUP

The EUT was examined at pre-scan tests using a fundamental frequency in the flatbed face-up (X+), flatbed face-down (X-), landscape (Y), portrait (Z) positions and the worst case orientation was determined, at landscape position, for final in-band and spurious emission measurements.

Measurements of the in-band signal and out-of-band spurious emissions were all performed at the production power settings.

The EUT was powered by a dummy battery connected to DC power supply set at 3.7 VDC in all test cases.



## 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	Local ID	Cal Date	Cal Due
EMI Test Receiver	Rohde & Schwarz	ESW44	PRE0203383	2/18/2020	2/18/2021
Horn Antenna, 1-18 GHz	ETS Lindgren	3117	T345	5/19/2020	5/19/2021
Preamp, 1-18 GHz	Miteq	AFS42-00101800-25-S-42	PRE0183207	6/11/2020	6/11/2021
PXA Signal Analyzer	Agilent	N9030A	T342	1/24/2020	1/24/2021
Hybrid Antenna, 30-2000 MHz	SunAR	JB1	T243	4/15/2020	4/15/2021
Preamp, 0.1-1300 MHz	Sonoma Inst.	310	T173	7/22/2020	7/22/2021
Antenna, Active Loop 9kHz-30MHz	ETS Lindgren	6502	PRE0154914	4/28/2020	4/30/2021
Spectrum Analyzer, 44GHz	Keysight	N9030A	T905	1/27/2020	1/27/2021
Preamplifier, 1-26.5GHz	Agilent	8449B	T404	4/8/2020	4/8/2021
Horn Antenna, 18-26.5GHz	ARA	MWH-1826/B	PRE0079280	4/17/2020	4/17/2021
Preamplifier, 26-40 GHz	Miteq	NSTTA2640-35-HG	T1864	4/8/2020	4/8/2021
Horn Antenna, 26-40 GHz	ARA	MWH-2640/B	PRE0182203	4/17/2020	4/17/2021
DC Power Supply	Hewlett Packard	E3610A	T502	NCR	--
Multimeter	Fluke	77	T78	1/21/2020	1/21/2021
Notch Filter, CH1	Bree Engineering	804165	SN: 3815-2-1	11/4/2020	11/4/2021
Notch Filter, CH4	Bree Engineering	804164	SN: 3815-1-1	11/4/2020	11/4/2021
Radiated Software	UL	UL EMC	Ver 9.5, Mar 6, 2020		

## 8. APPLICABLE LIMITS AND TEST RESULTS

### 8.1. OPERATING BANDWIDTH

#### LIMIT

§15.503 (a) *UWB bandwidth*. For the purpose of this subpart, the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated  $f_H$  and the lower boundary is designated  $f_L$ . The frequency at which the highest radiated emission occurs is designated  $f_M$ .

§15.503 (b) *Center frequency*. The center frequency,  $F_C$ , equals  $(F_H + F_L)/2$ .

§15.503 (c) *Fractional bandwidth*. The fractional bandwidth equals  $2(F_H - F_L) / (F_H + F_L)$ .

§15.503 (d) *Ultra-wideband (UWB) transmitter*. An intentional radiator that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

§15.519 (b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

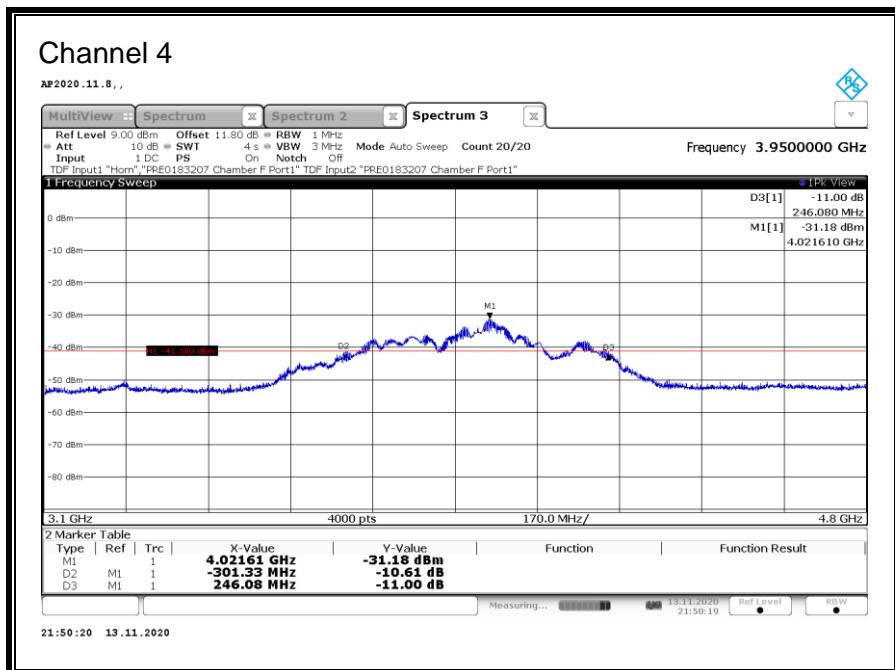
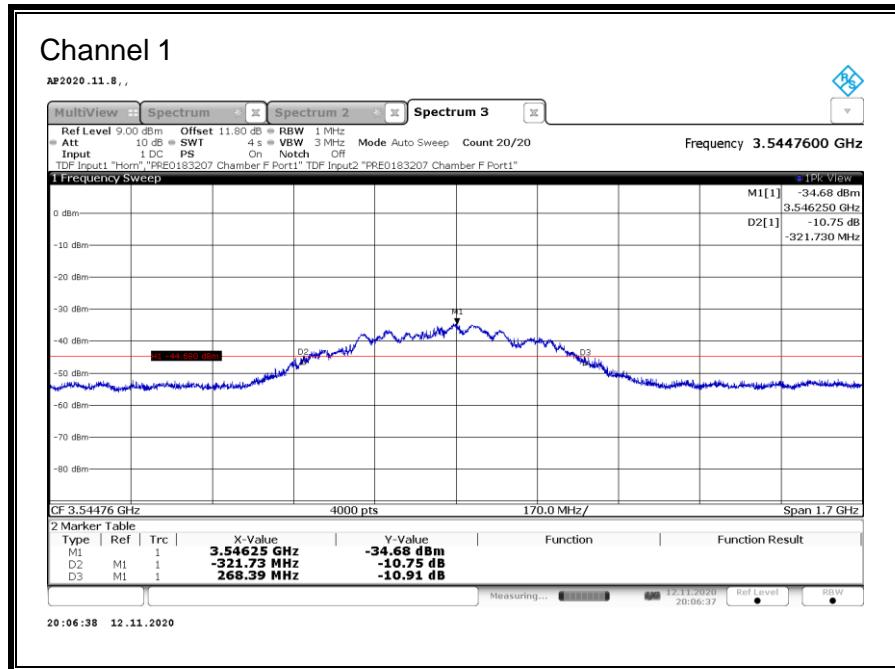
#### TEST PROCEDURE

ANSI C63.10 Clause 10.1.

## RESULTS

Tested By: 19419 & 12471

CH	EUT Orientation	Meas. Ant Polarity	FM (GHz)	FL Delta (GHz)	FH Delta (GHz)	FL (GHz)	FH (GHz)	FC (GHz)	OBW (MHz)	Min. OBW (MHz)	OBW Margin (MHz)	OBW Pass/Fail
1	Landscape	V	3.5463	0.3217	0.2684	3.2245	3.8146	3.5196	590.12	500	90.12	P
4	Landscape	V	4.0216	0.3013	0.2461	3.7755	4.3229	4.0492	547.41	500	47.41	P



## 8.2. PEAK POWER AND MAXIMUM AVERAGE EMISSIONS

### LIMIT

15.519 (e) There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs,  $f_M$ . That limit is 0 dBm EIRP.

15.519 (c) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequency in MHz	EIRP in dBm
3100 - 10600	-41.3

### TEST PROCEDURE

ANSI C63.10 Clause 10.3.

Peak EIPR power is measured using RBW of 50 MHz.

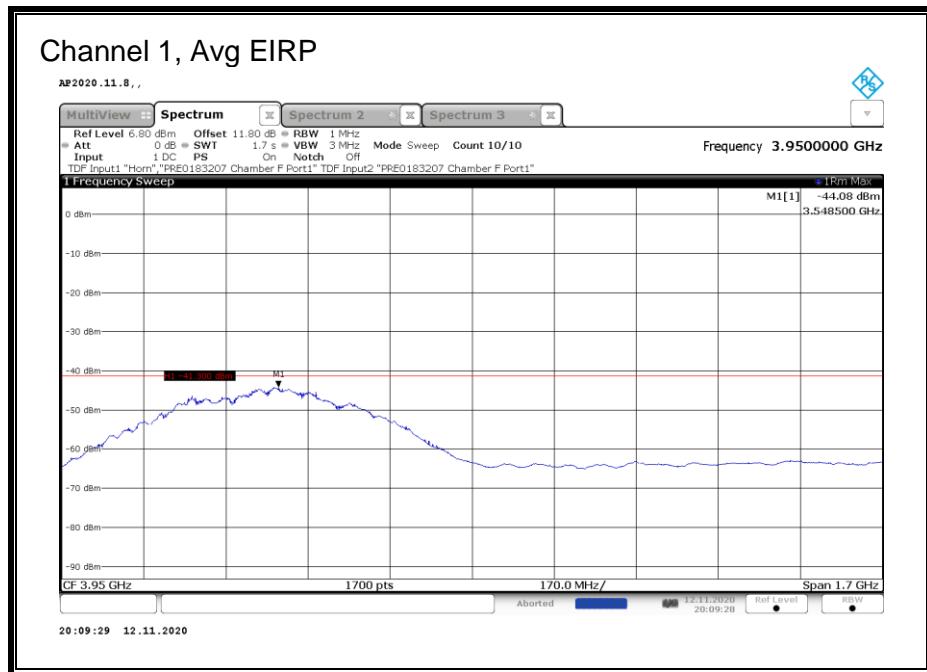
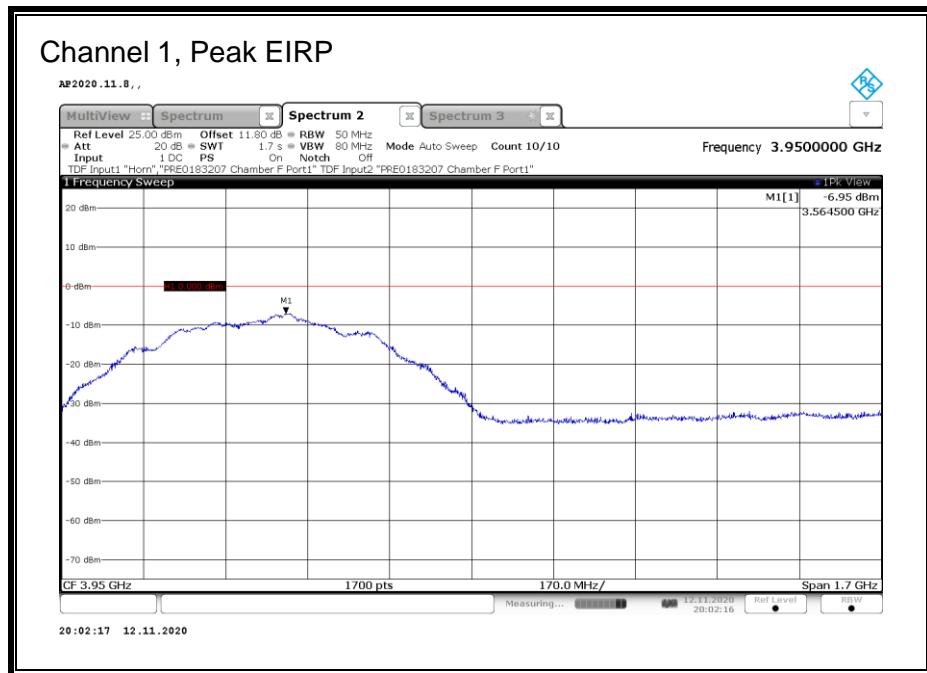
The radiated emissions of 3.1 – 4.8 GHz frequency band are performed at 3 meter test distance.

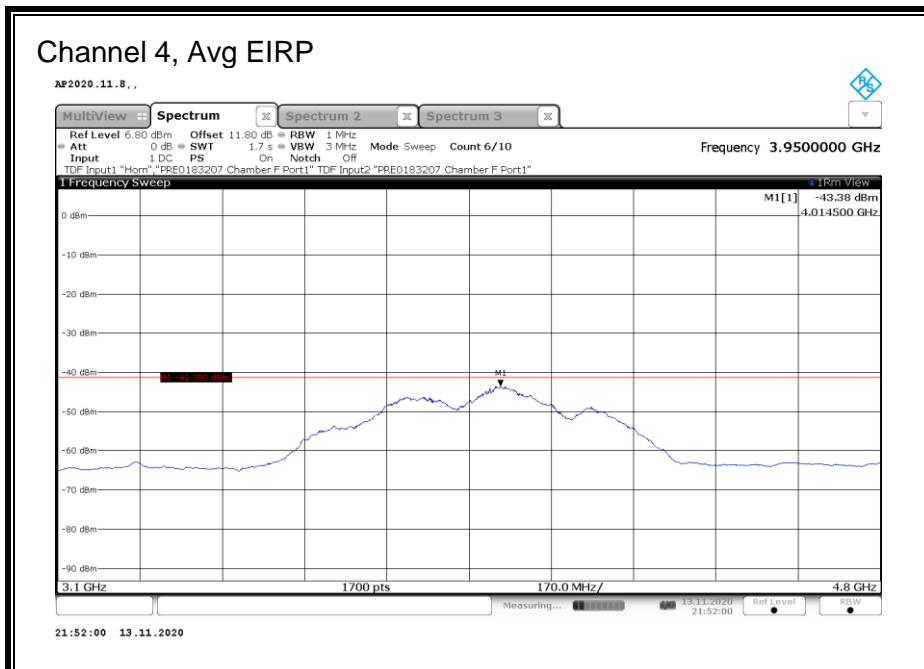
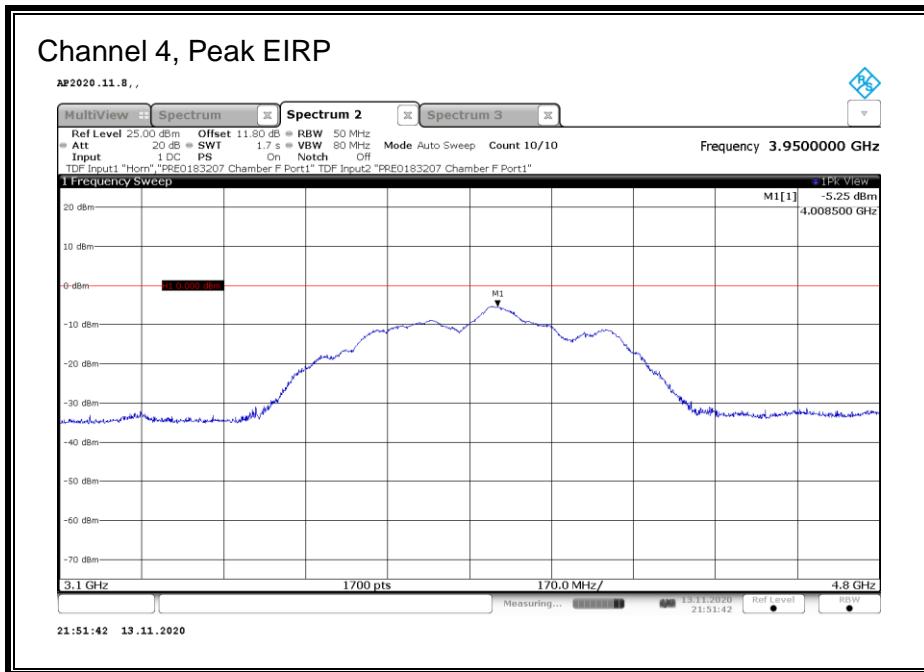
## **RESULTS**

Tested By: 19419 & 12471

CH	EUT Orientation	Meas. Ant. Polarity	Peak EIRP Power				Average EIRP Power			
			FM (GHz)	Peak Power (dBm/50MHz)	Peak Limit (dBm/50MHz)	Margin (dB)	FM (GHz)	Avg Power (dBm/MHz)	Avg Limit (dBm/MHz)	Margin (dB)
1	Landscape	V	3.5645	-6.95	0	-6.95	3.5485	-44.08	-41.3	-2.78
4	Landscape	V	4.0085	-5.25	0	-5.25	4.0145	-43.38	-41.3	-2.08

## RESULTS





### 8.3. CESSATION TIME

#### LIMIT

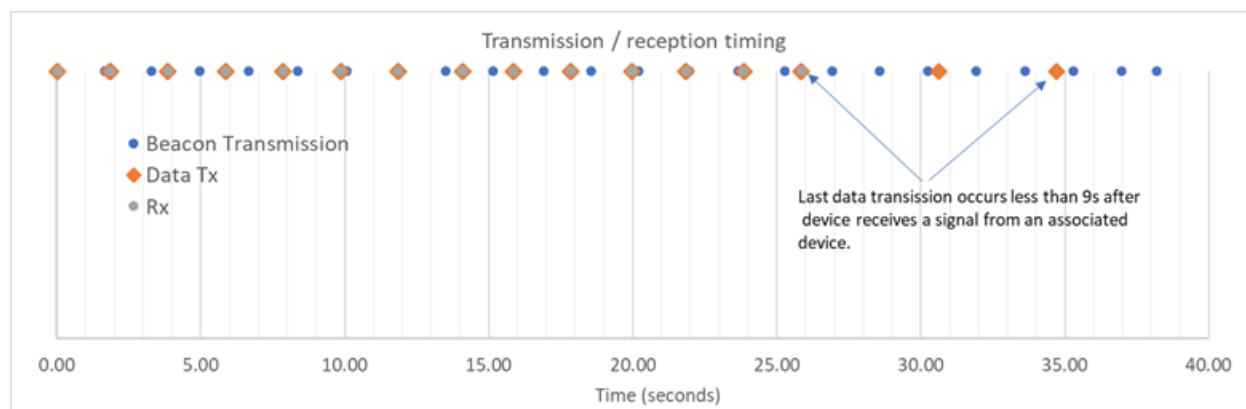
§15.519(a)(1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

#### TEST PROCEDURES

Transmission is monitored when the EUT badge initiates the UWB link with the pairing associated device (another badge).

#### RESULT

The following graph is based on the exported log file from the EUT log manager.



As shown on the log of transmission, the EUT ceased UWB transmission (Data Tx) within 10 seconds, due to not receiving an acknowledgement of polling beacon signal (Beacon Transmission) from the associated device (Rx) on the graph.

The EUT sends a polling beacon signal (Beacon Transmission) every ~1.6 s, then if an acknowledgement from an associated device (Rx) is received within the configured radius, an UWB transmission (Data Tx) will occur. When the associated device is no longer paired or falls outside of the pre-configured range, an Rx error results and the EUT will cease UWB transmission within 10 s. However, the polling beacon signal of EUT continues to search for other device to pair.

## 8.4. EMISSIONS BELOW 960 MHz

### LIMITS

§15.519 (c) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209. The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

#### 15.209 (a)

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

### TEST PROCEDURE

ANSI C63.10 Clause 10.2 and 10.3.

### PROCEDURE FOR 9 kHz TO 960 MHz

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a distance of 3 m from the EUT.

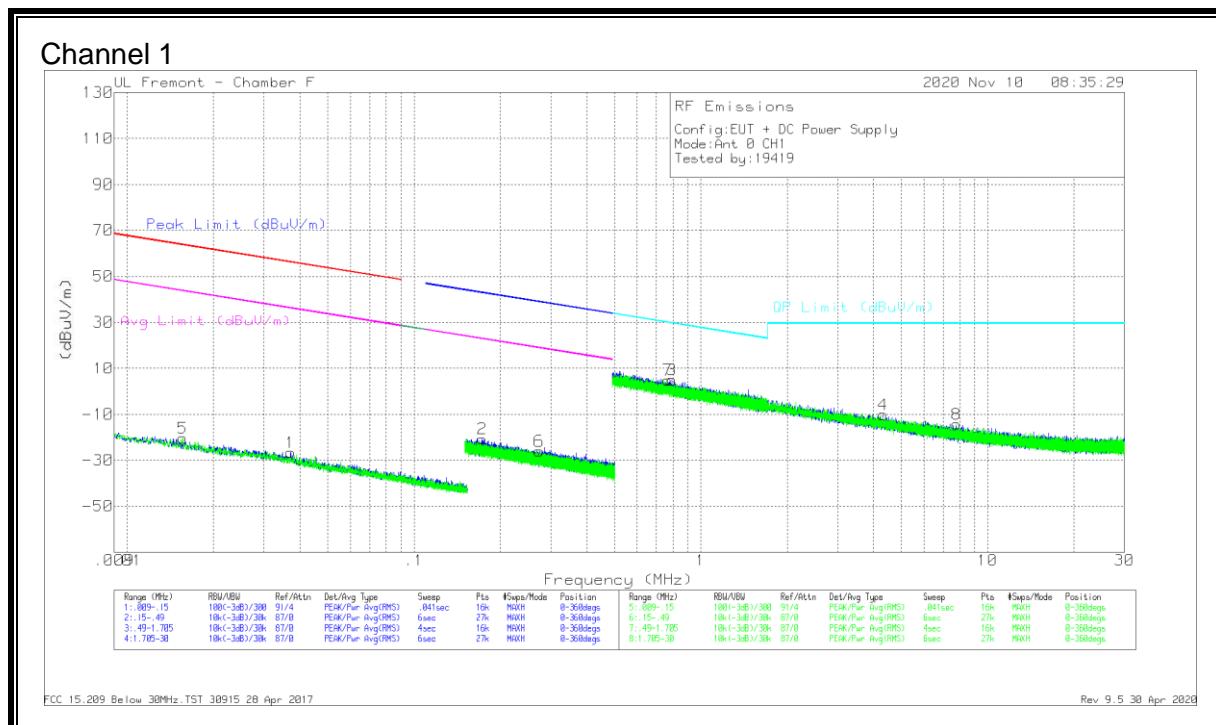
### RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

$$\begin{aligned}\text{Field Strength (dBuV/m)} &= \text{Measured Voltage (dBuV)} + \text{Antenna Factor (dB/m)} \\ &\quad + \text{Cable Loss (dB)} - \text{Pre-Amp Gain (dB)} - \text{Distance Correction (dB)} \\ &= 39.7 \text{ dBuV} + 13.7 \text{ dB/m} + 0.1 \text{ dB} - 30 \text{ dB} - 40 \text{ dB} \\ &= -16.5 \text{ dBuV/m}\end{aligned}$$

### RESULTS

### 8.4.1. EMISSIONS, 9 kHz – 30 MHz



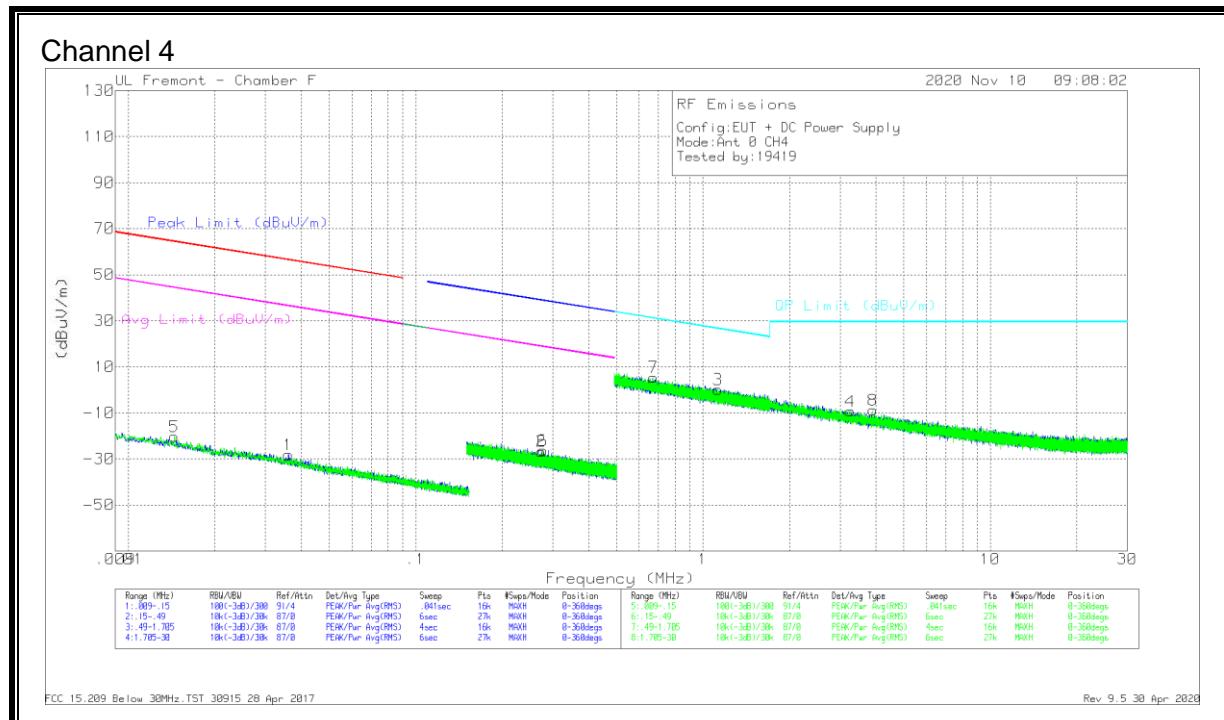
#### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.03712	39.7	Pk	13.7	0	-80	-26.6	56.19	-82.79	36.19	-62.79	0-360
2	.17313	48.11	Pk	11.1	.1	-80	-20.69	42.85	-63.54	22.85	-43.54	0-360
5	.01562	42.84	Pk	16.8	0	-80	-20.36	63.71	-84.07	43.71	-64.07	0-360
6	.27311	43.05	Pk	10.9	.1	-80	-25.95	38.89	-64.84	18.89	-44.84	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.7924	33.9	Pk	11	.1	-40	5	29.64	-24.64	0-360
4	4.325	18.34	Pk	11.3	.2	-40	-10.16	29.5	-39.66	0-360
7	.76732	33.77	Pk	11	.1	-40	4.87	29.92	-25.05	0-360
8	7.80331	14.5	Pk	10.9	.3	-40	-14.3	29.5	-43.8	0-360

Pk - Peak detector



## Trace Markers

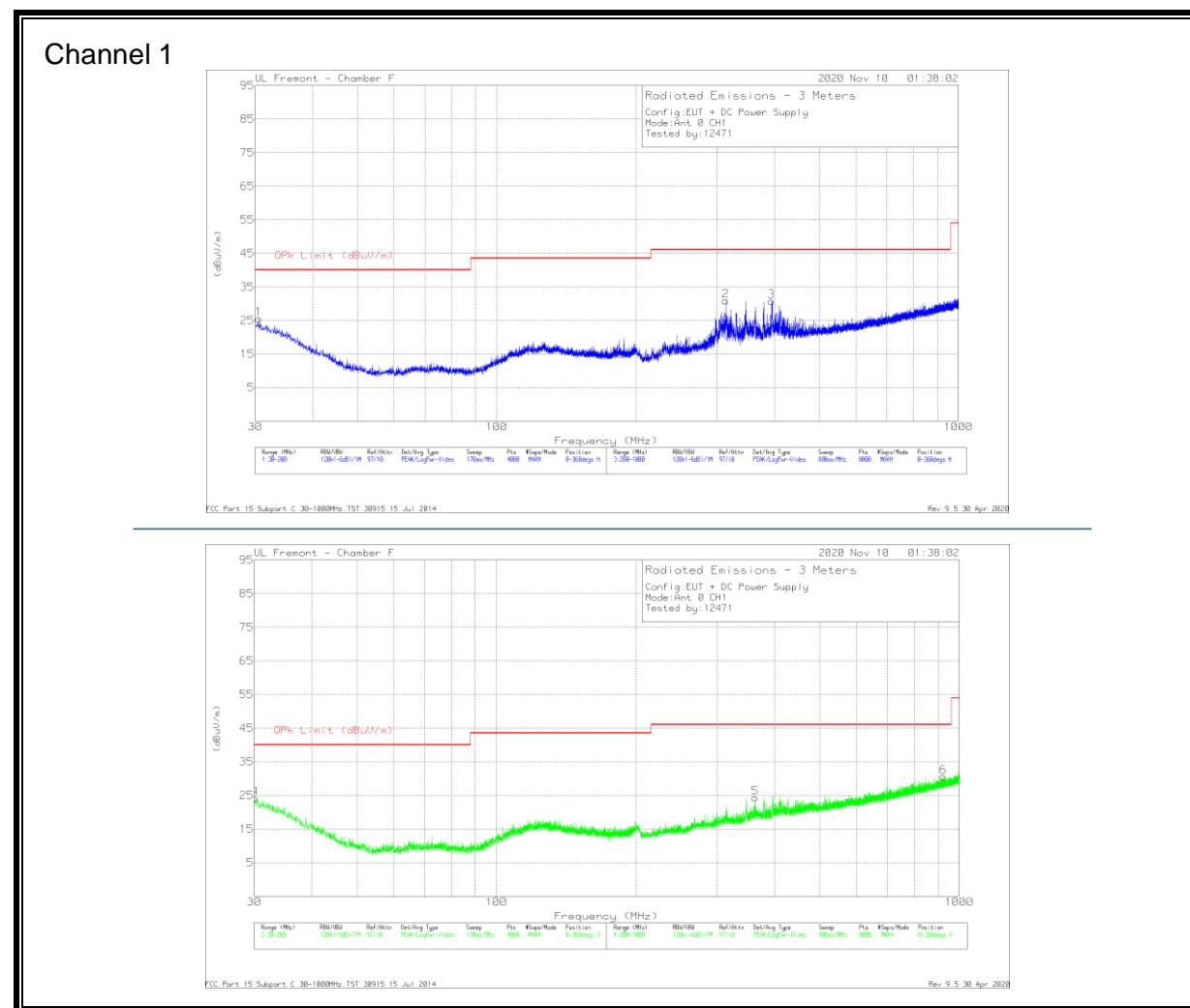
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr 300m (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.03606	38.01	PK	13.8	0	-80	-28.19	56.44	-84.63	36.44	-64.63	0-360
2	.27363	42.31	PK	10.9	.1	-80	-26.69	38.87	-65.56	18.87	-45.56	0-360
5	.01446	42.49	PK	17.2	0	-80	-20.31	64.38	-84.69	44.38	-64.69	0-360
6	.27693	42.65	PK	10.9	.1	-80	-26.35	38.77	-65.12	18.77	-45.12	0-360

Pk - Peak detector

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna (dB/m)	Cables (dB)	Dist Corr (dB) 40Log	Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	1.12848	28.85	Pk	11.2	.1	-40	.15	26.57	-26.42	0-360
4	3.25814	19.17	Pk	11.3	.2	-40	-9.33	29.5	-38.83	0-360
7	.67202	34.32	Pk	11	.1	-40	5.42	31.06	-25.64	0-360
8	3.89742	19.63	Pk	11.4	.2	-40	-8.77	29.5	-38.27	0-360

Pk - Peak detector

### 8.4.2. EMISSIONS, 30 – 960 MHz

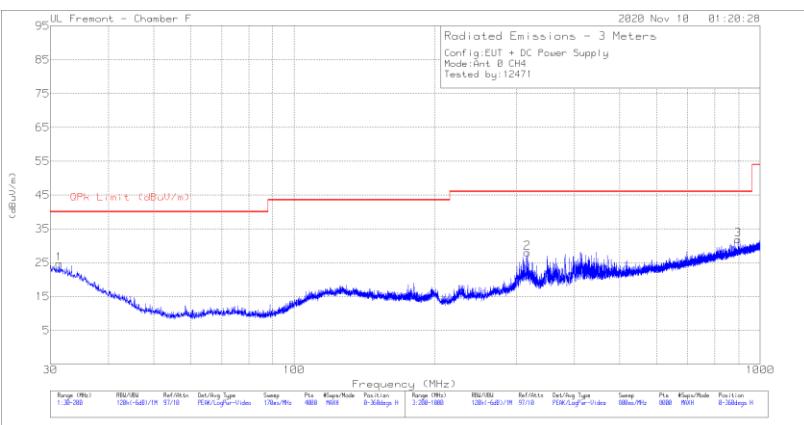


#### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPK Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.5526	29.61	Pk	27.8	-31.9	25.51	40	-14.49	0-360	101	H
4	30.085	28.02	Pk	28.1	-31.9	24.22	40	-15.78	0-360	100	V
2	313.4147	40.38	Pk	20.3	-29.8	30.88	46.02	-15.14	0-360	99	H
3	393.9252	38.54	Pk	21.7	-29.5	30.74	46.02	-15.28	0-360	99	H
5	362.3211	32.55	Pk	21.4	-29.6	24.35	46.02	-21.67	0-360	99	V
6	922.994	28.11	Pk	29	-26.5	30.61	46.02	-15.41	0-360	201	V

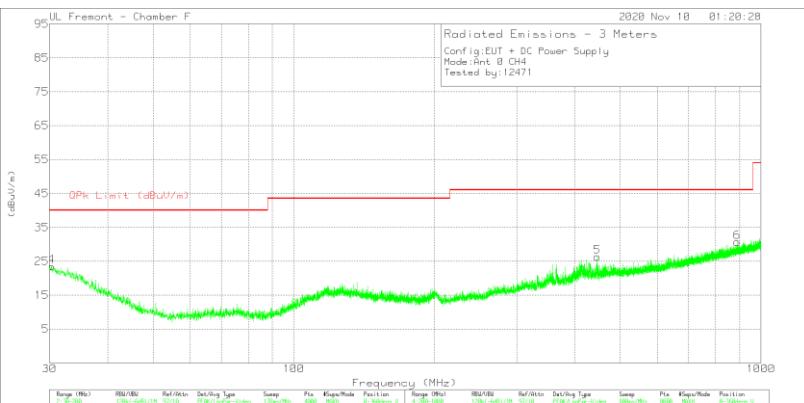
Pk - Peak detector

Channel 4



FCC Part 15 Subpart C 30-1000MHz TST 38915.15 Jul 2014

Rev. 9.5 30 Apr. 2020



FCC Part 15 Subpart C 30-1000MHz TST 38915.15 Jul 2014

Rev. 9.5 30 Apr. 2020

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF T243 (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	OPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.3604	29.48	Pk	27.1	-31.9	24.68	40	-15.32	0-360	201	H
4	30.2976	27.41	Pk	28	-31.9	23.51	40	-16.49	0-360	100	V
2	316.7152	37.52	Pk	20.3	-29.8	28.02	46.02	-18	0-360	99	H
3	897.5907	30.17	Pk	28.6	-26.9	31.87	46.02	-14.15	0-360	201	H
5	446.132	32.62	Pk	22.8	-29.1	26.32	46.02	-19.7	0-360	98	V
6	889.1896	29.09	Pk	28.5	-26.9	30.69	46.02	-15.33	0-360	98	V

Pk - Peak detector

## 8.5. EMISSIONS ABOVE 960 MHz

### LIMITS

15.519 (c)

Frequency in MHz	EIRP in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

§15.519 (d) In addition to the radiated emission limits specified in the table in paragraph (c) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

## **TEST PROCEDURES**

ANSI C63.10 Clause 10.2 and 10.3.

### **PROCEDURE FOR 960 MHz TO 3.1 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a distance of 0.5 m from the EUT.

A band-reject filter is used to suppress the fundamental and perform measurement for 0.96 – 3.1 GHz.

### **RESULTS FOR 3.1 GHz TO 4.8 GHz**

The 3.1 – 4.8 GHz frequency band is covered in Section 8.2.

### **PROCEDURE FOR 4.8 GHz TO 18 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a distance of 0.5 m from the EUT.

A band-reject filter is used to suppress the fundamental and perform measurement for 4.8 - 8 GHz. An 8 GHz high pass filter is used to suppress the fundamental and perform measurement for 8 - 18 GHz.

### **PROCEDURE FOR 1.164 TO 1.240 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a distance of 0.5 m from the EUT.

RBW = 120 kHz & VBW = 360 kHz were used at pre-scan.

A band-reject filter is used to suppress the fundamental and perform measurement for 1.164 – 1.240 GHz.

### **PROCEDURE FOR 1.559 TO 1.610 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a distance of 0.5 m from the EUT.

RBW = 120 kHz & VBW = 360 kHz were used at pre-scan.

A band-reject filter is used to suppress the fundamental and perform measurement for 1.559 – 1.610 GHz.

## **PROCEDURE FOR 18 GHz TO 40 GHz**

Measurements are made with the antenna feeding a spectrum analyzer via a preamplifier and cables, at a distance of 0.5 m from the EUT.

A final test is made at any frequencies at which emissions are found. During this final scan, the antenna is kept no further from the EUT than the maximum distance calculated for each band that yields a minimum system noise floor.

Distance Correction Factor from 3 m to 0.5 m =  $20 \log (0.5 \text{ m} / 3 \text{ m}) = -15.56 \text{ dB}$

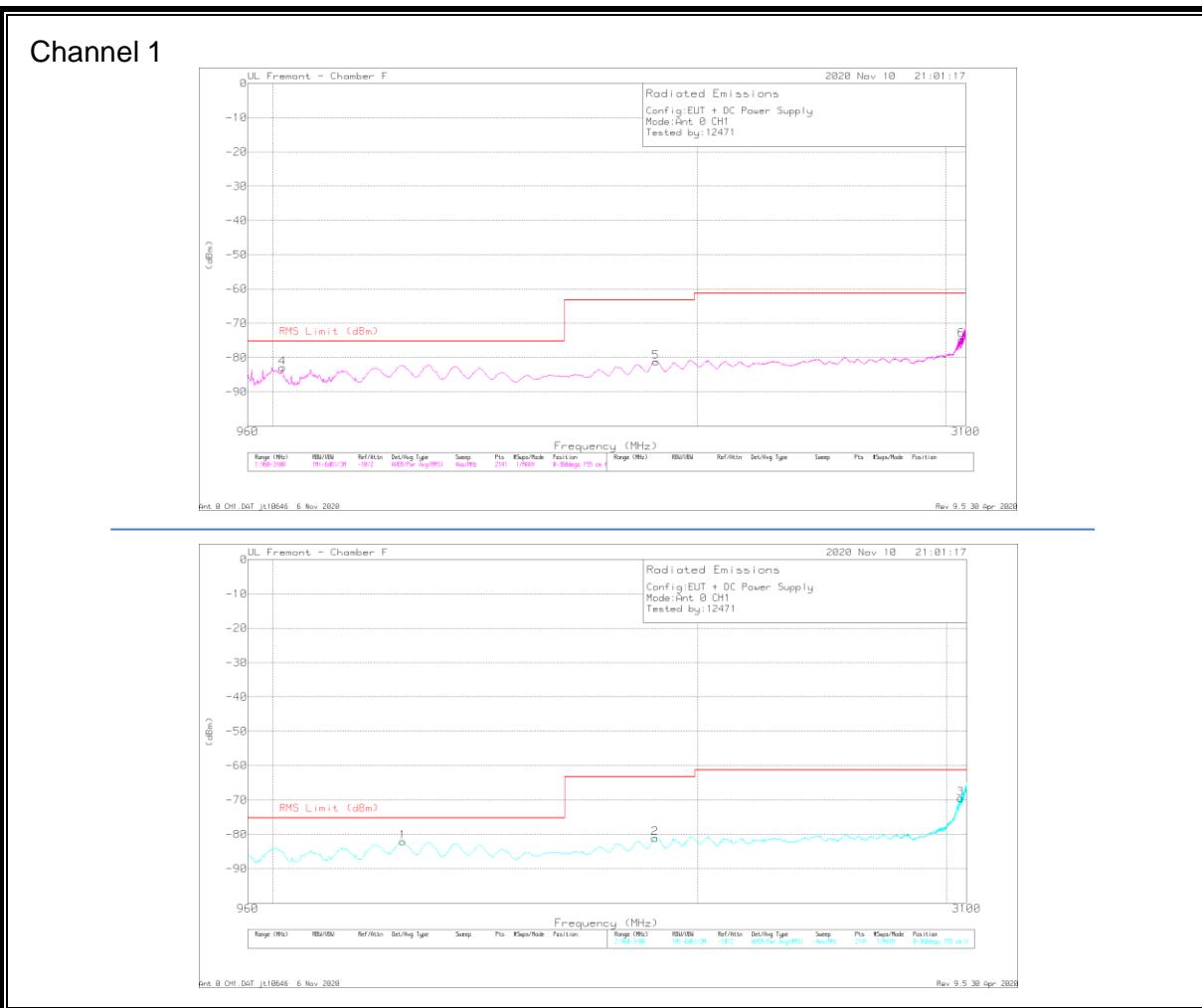
## **RADIATED EMISSIONS**

Where relevant, the following sample calculation is provided:

$$\begin{aligned} \text{EIRP (dBm)} &= \text{Measured Power (dBm)} + \text{Antenna Factor (dB/m)} - \text{Pre-Amp Gain/Cbl Loss (dB)} \\ &\quad - \text{Distance Correction (dB)} + \text{EIRP Conversion Factor @ 3m (dB)} + \text{Filter Loss(dB)} \\ &= -61.48 \text{ dBm} + 27.3 \text{ dB/m} - 45.2 \text{ dB} - 15.6 \text{ dB} + 11.8 \text{ dB} + 0.2 \text{ dB} \\ &= -82.98 \text{ dBuV/m} \end{aligned}$$

## **RESULTS**

## 8.5.1. AVERAGE EMISSIONS, 0.96 – 3.1 GHz



### Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 3.5GHz PN804165 (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	1016	-61.48	RMS	27.3	-45.2	-15.6	11.8	.2	-82.98	-75.3	-7.68	264	155	H
5	1870	-63.79	RMS	31.3	-45.2	-15.6	11.8	.3	-81.19	-63.3	-17.89	110	155	H
6	3078	-61.22	RMS	32.9	-44.1	-15.6	11.8	1.5	-74.72	-61.3	-13.42	242	155	H
1	1236	-62.99	RMS	29.8	-45.4	-15.6	11.8	.3	-82.09	-75.3	-6.79	119	155	V
2	1865	-63.36	RMS	31.1	-45.3	-15.6	11.8	.3	-81.06	-63.3	-17.76	228	155	V
3	3069	-55.99	RMS	32.9	-44.1	-15.6	11.8	1.5	-69.49	-61.3	-8.19	317	155	V

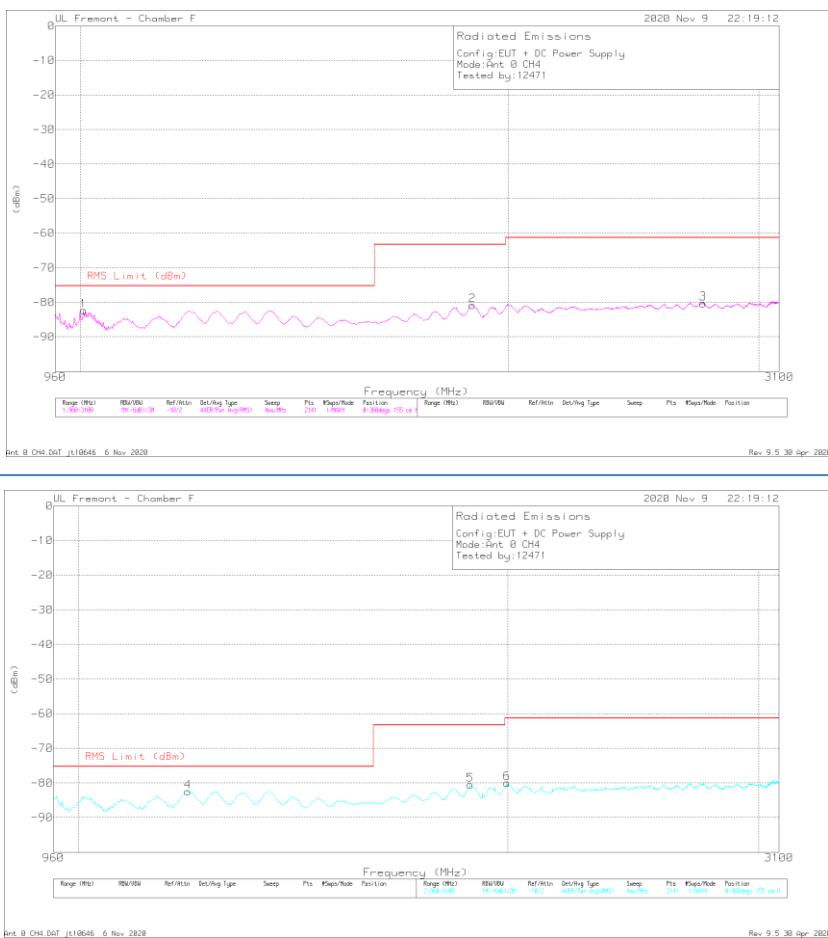
RMS - RMS detection

### Radiated Emissions

Frequency (MHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 3.5GHz PN804165 (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
3100	-55.71	RMS	32.9	-44.1	-15.6	11.8	2.2	-68.51	-61.3	-7.21	305	155	H
3100	-50.59	RMS	32.9	-44.1	-15.6	11.8	2.2	-63.39	-61.3	-2.09	14	155	V

RMS - RMS detection

Channel 4

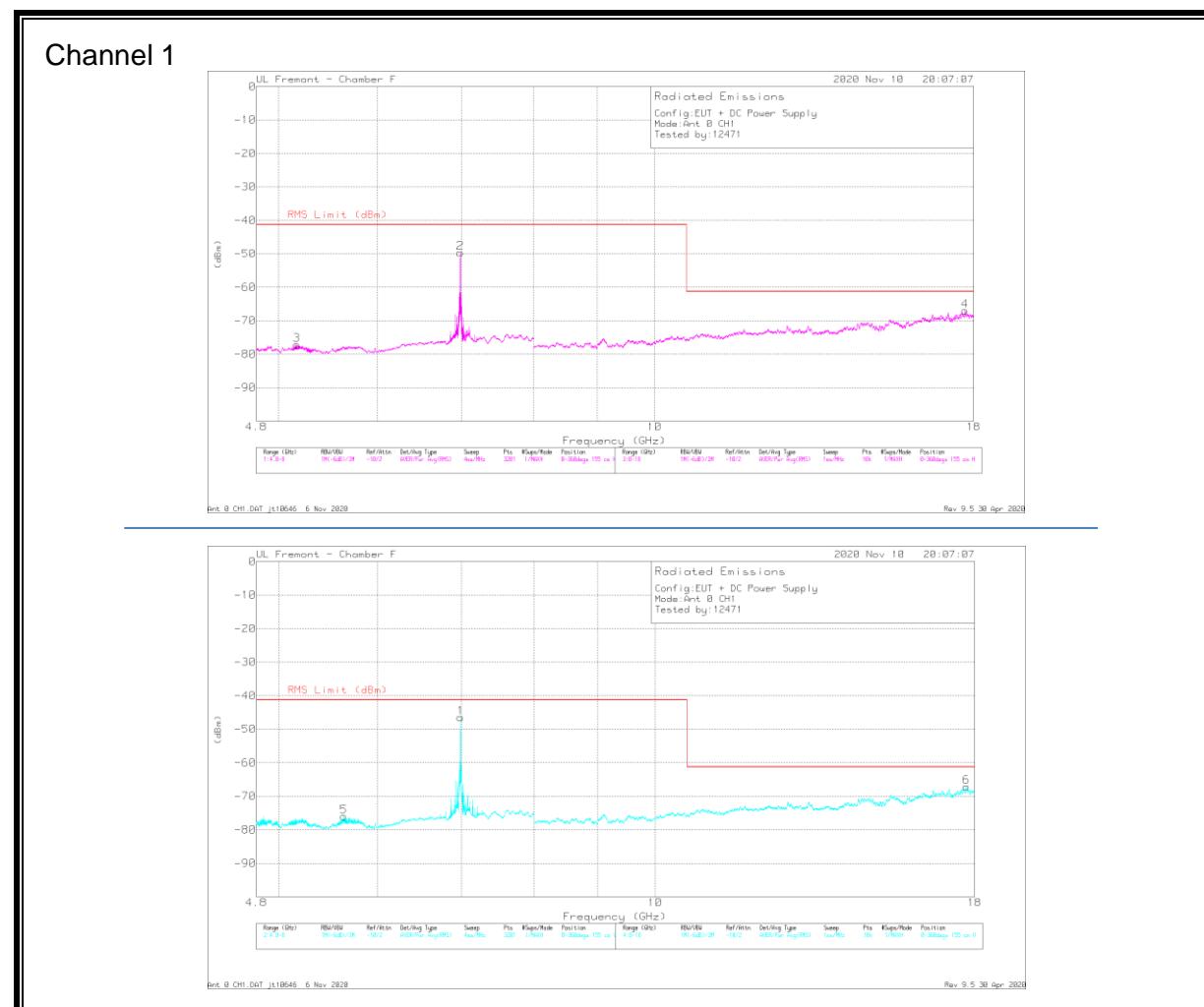


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 4GHz PN904164 (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1005	-61.28	RMS	27.7	-45.2	-15.6	11.8	.2	-82.38	-75.3	-7.08	141	155	H
2	1887	-63.51	RMS	31.3	-45.1	-15.6	11.8	.3	-80.81	-63.3	-17.51	207	155	H
3	2740	-64.89	RMS	32.5	-44.6	-15.6	11.8	.5	-80.29	-61.3	-18.99	162	155	H
4	1193	-63.01	RMS	29.2	-45.1	-15.6	11.8	.2	-82.51	-75.3	-7.21	207	155	V
5	1882	-63.21	RMS	31.2	-45	-15.6	11.8	.3	-80.51	-63.3	-17.21	207	155	V
6	1997	-62.83	RMS	31.7	-45.4	-15.6	11.8	.3	-80.03	-61.3	-18.73	31	155	V

RMS - RMS detection

## 8.5.2. AVERAGE EMISSIONS, 4.8 – 18 GHz



### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 4GHz PN804164 (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	6.989	-43.15	RMS	35.7	-40.8	-15.6	11.8	2.4	-49.65	-41.3	-8.35	21	155	H
3	5.173	-65.44	RMS	34.4	-42.8	-15.6	11.8	.4	-77.24	-41.3	-35.94	330	155	H
1	6.989	-39.93	RMS	35.7	-40.8	-15.6	11.8	2.4	-46.43	-41.3	-5.13	295	155	V
5	5.638	-66.17	RMS	34.7	-41.3	-15.6	11.8	.5	-76.07	-41.3	-34.77	317	155	V

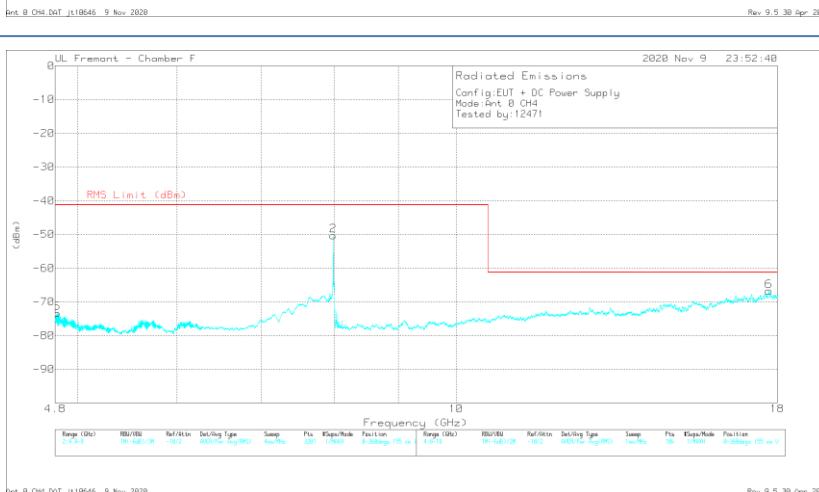
RMS - RMS detection

### Radiated Emissions

Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 4GHz PN804164 (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
6.989	-40.66	RMS	35.7	-40.8	-15.6	11.8	2.4	-47.16	-41.3	-5.86	339	155	H
6.989	-39.44	RMS	35.7	-40.8	-15.6	11.8	2.4	-45.94	-41.3	-4.64	4	155	V

RMS - RMS detection

Channel 4



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 4GHz PN804164 (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	7.987	-60.5	RMS	35.8	-39.1	-15.6	11.8	9.8	-57.8	-41.3	-16.5	1	155	H
3	5.585	-65.26	RMS	34.6	-41.7	-15.6	11.8	7	-75.46	-41.3	-34.16	154	155	H
2	7.987	-53.01	RMS	35.8	-39.1	-15.6	11.8	9.8	-50.31	-41.3	-9.01	176	155	V
5	4.82	-62.17	RMS	34.4	-43.7	-15.6	11.8	1.9	-73.37	-41.3	-32.07	154	155	V

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	17.727	-70.75	RMS	41.6	-33.8	-15.6	11.8	-66.75	-61.3	-5.45	294	155	H
6	17.726	-70.53	RMS	41.5	-33.9	-15.6	11.8	-66.73	-61.3	-5.43	0	155	V

RMS - RMS detection

Radiated Emissions

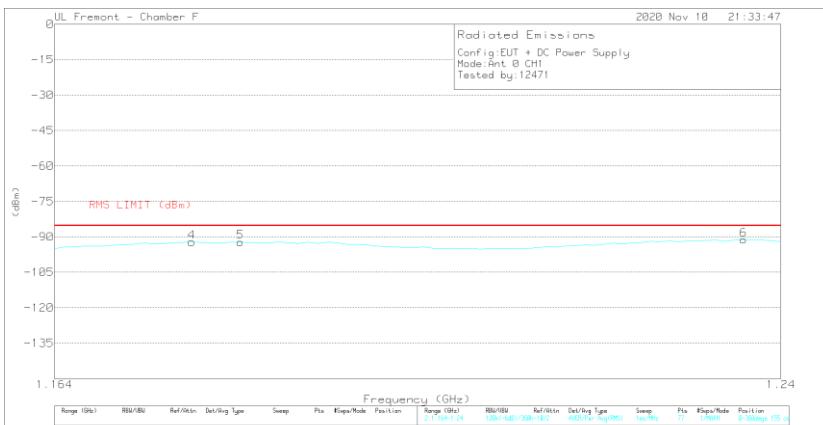
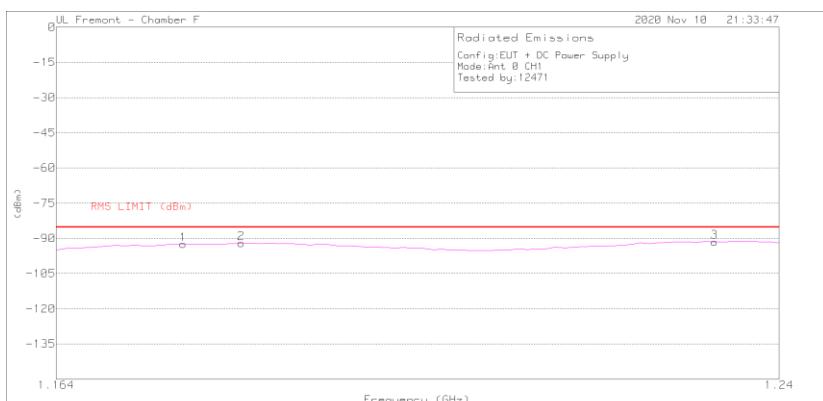
Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 4GHz PN804164 (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
7.987	-58.63	RMS	35.8	-39.1	-15.6	11.8	9.8	-55.93	-41.3	-14.63	168	155	H
7.987	-50.84	RMS	35.8	-39.1	-15.6	11.8	9.8	-48.14	-41.3	-6.84	182	155	V

Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl/Fltr/Pad (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
17.725	-70.5	RMS	41.6	-33.9	-15.6	11.8	-66.6	-61.3	-5.3	284	155	V

RMS - RMS detection

### 8.5.3. AVERAGE EMISSIONS, 1.164 – 1.240 GHz

#### Channel 1

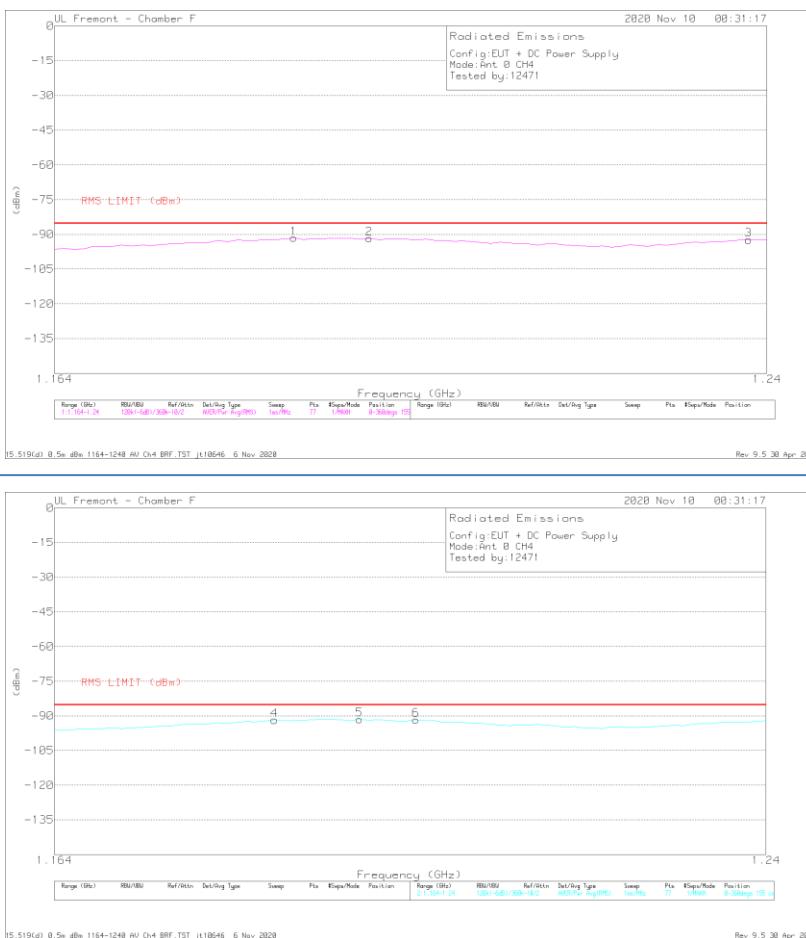


#### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 3.5GHz PN804165 (dB)	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.177	-72.19	RMS	28.7	-45.4	-15.6	11.8	.2	-92.49	-85.3	-7.19	185	155	H
2	1.183	-72.01	RMS	29	-45.4	-15.6	11.8	.2	-92.01	-85.3	-6.71	30	155	H
3	1.233	-72.26	RMS	29.8	-45.4	-15.6	11.8	.2	-91.46	-85.3	-6.16	273	155	H
4	1.178	-71.86	RMS	28.7	-45.4	-15.6	11.8	.2	-92.16	-85.3	-6.86	75	155	V
5	1.183	-72.19	RMS	29	-45.4	-15.6	11.8	.2	-92.19	-85.3	-6.89	316	155	V
6	1.236	-72.11	RMS	29.8	-45.4	-15.6	11.8	.3	-91.21	-85.3	-5.91	96	155	V

RMS - RMS detection

Channel 4



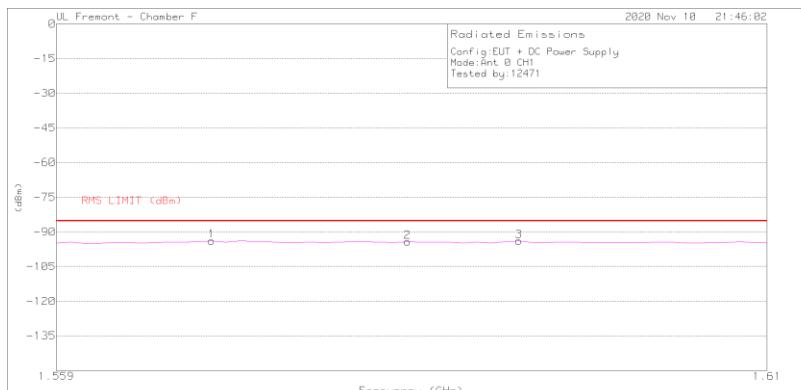
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 4GHz PN804164 (dB)	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.189	-71.83	RMS	29.1	-45.2	-15.6	11.8	.2	-91.53	-85.3	-6.23	153	155	H
2	1.197	-72.56	RMS	29.5	-45.1	-15.6	11.8	.2	-91.76	-85.3	-6.46	1	155	H
3	1.238	-73.03	RMS	29.7	-45.4	-15.6	11.8	.2	-92.33	-85.3	-7.03	330	155	H
4	1.187	-72.07	RMS	29.1	-45.2	-15.6	11.8	.2	-91.77	-85.3	-6.47	285	155	V
5	1.196	-72.19	RMS	29.4	-45.1	-15.6	11.8	.2	-91.49	-85.3	-6.19	308	155	V
6	1.202	-72.57	RMS	29.6	-45.1	-15.6	11.8	.2	-91.67	-85.3	-6.37	263	155	V

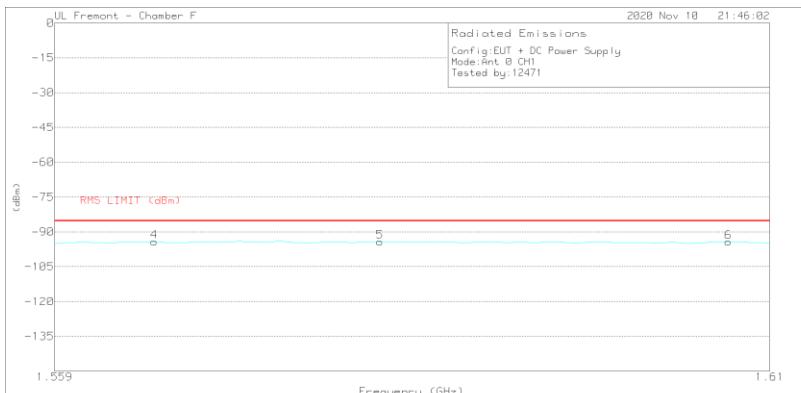
RMS - RMS detection

## 8.5.4. AVERAGE EMISSIONS, 1.559 – 1.610 GHz

### Channel 1



15.519(d) 0.5m dBx 1559-1610 Ant Ch1 BRF TST J118646 6 Nov 2020 Rev. 9.5 30 Apr. 2020



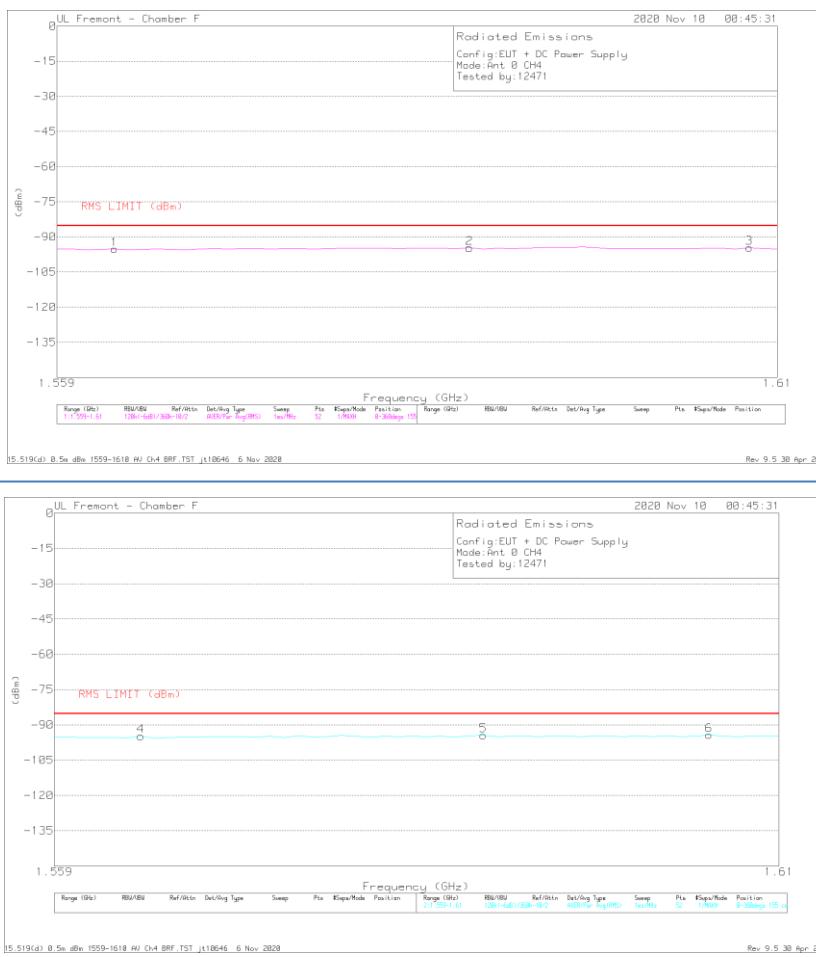
15.519(d) 0.5m dBx 1559-1610 Ant Ch1 BRF TST J118646 6 Nov 2020 Rev. 9.5 30 Apr. 2020

### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dB/m)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 3.5GHz PN804165 (dB)	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.57	-73.05	RMS	28	-45.2	-15.6	11.8	.2	-93.85	-85.3	-8.55	109	155	H
2	1.584	-73.4	RMS	27.9	-45.2	-15.6	11.8	.2	-94.3	-85.3	-9	242	155	H
3	1.592	-73.12	RMS	28	-45.3	-15.6	11.8	.3	-93.92	-85.3	-8.62	87	155	H
4	1.566	-73.31	RMS	27.9	-45.2	-15.6	11.8	.2	-94.21	-85.3	-8.91	263	155	V
5	1.582	-73.34	RMS	27.9	-45.2	-15.6	11.8	.2	-94.24	-85.3	-8.94	263	155	V
6	1.607	-73.49	RMS	28	-45.3	-15.6	11.8	.3	-94.29	-85.3	-8.99	286	155	V

RMS - RMS detection

Channel 4



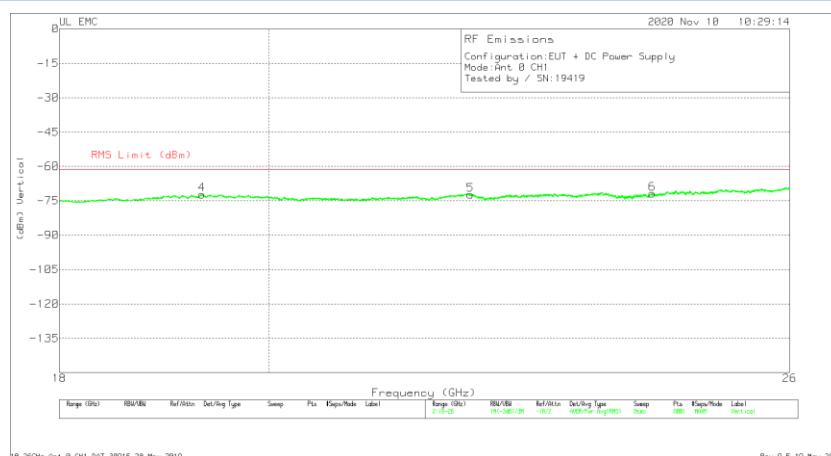
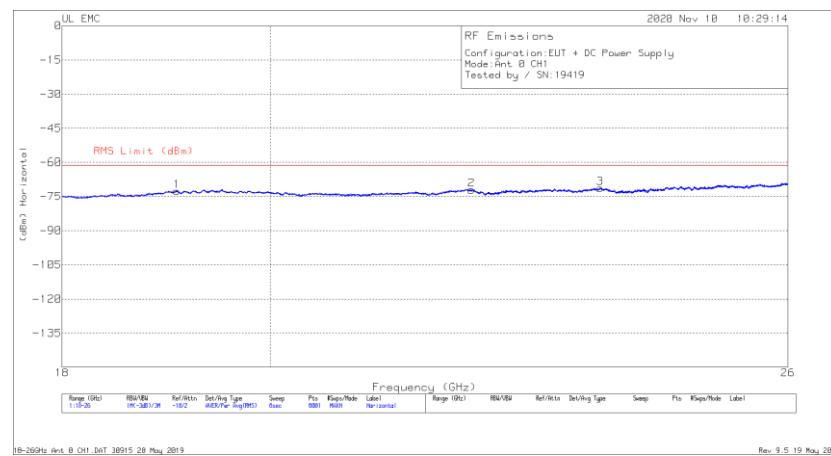
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	AF T119 (dBm)	Amp/Cbl (dB)	Dist. Corr. (dB)	Conv. Fact. (dB)	BRF 4GHz PN604164 (dB)	Corrected Reading (dBm)	RMS LIMIT (dBm)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.563	-74.42	RMS	27.9	-45.2	-15.6	11.8	.3	-95.22	-85.3	-9.92	141	155	H
2	1.588	-73.93	RMS	28	-45.3	-15.6	11.8	.3	-94.73	-85.3	-9.43	207	155	H
3	1.608	-73.71	RMS	28	-45.3	-15.6	11.8	.2	-94.61	-85.3	-9.31	97	155	H
4	1.565	-73.96	RMS	27.9	-45.2	-15.6	11.8	.3	-94.76	-85.3	-9.46	163	155	V
5	1.589	-73.62	RMS	28	-45.3	-15.6	11.8	.3	-94.42	-85.3	-9.12	251	155	V
6	1.605	-73.42	RMS	28	-45.3	-15.6	11.8	.2	-94.32	-85.3	-9.02	75	155	V

RMS - RMS detection

## 8.5.5. AVERAGE EMISSIONS, 18 - 26 GHz

### Channel 1

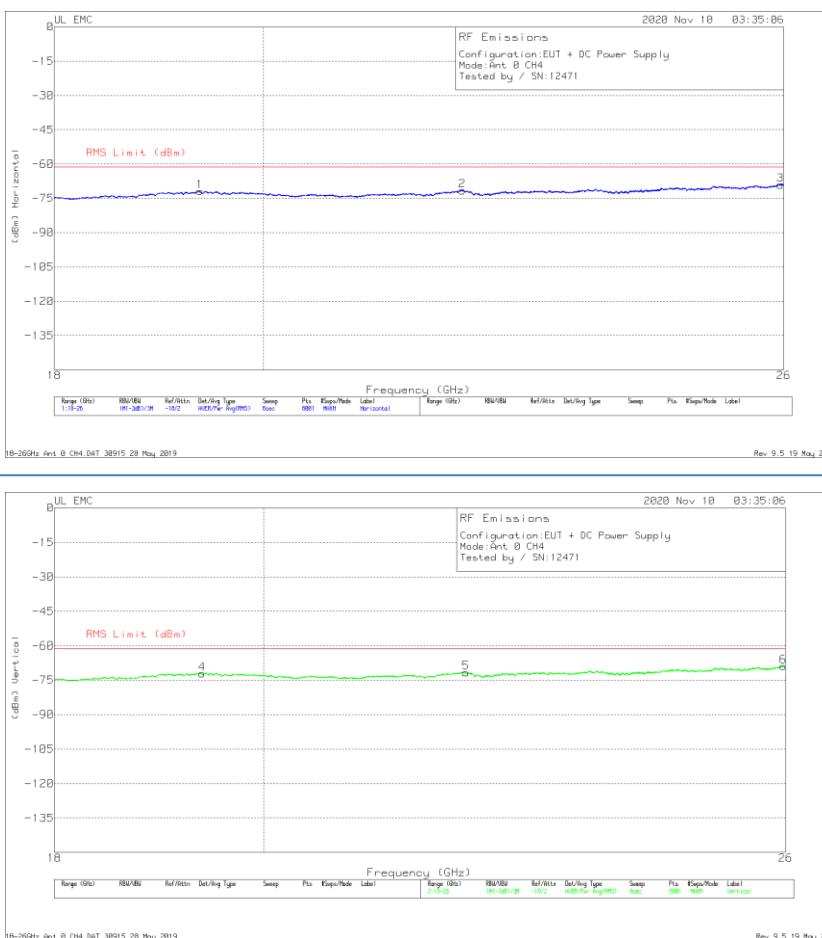


### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	T125 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)
1	19.078	-81.81	RMS	32.7	-19.6	-15.6	11.8	-72.51	-61.3	-11.21
2	22.148	-81.43	RMS	33.4	-20.2	-15.6	11.8	-72.03	-61.3	-10.73
3	23.64	-81.55	RMS	33.7	-19.7	-15.6	11.8	-71.35	-61.3	-10.05
4	19.338	-82.42	RMS	32.6	-18.6	-15.6	11.8	-72.22	-61.3	-10.92
5	22.14	-81.7	RMS	33.4	-20.2	-15.6	11.8	-72.3	-61.3	-11
6	24.262	-82.62	RMS	33.8	-19.2	-15.6	11.8	-71.82	-61.3	-10.52

RMS - RMS detection

Channel 4



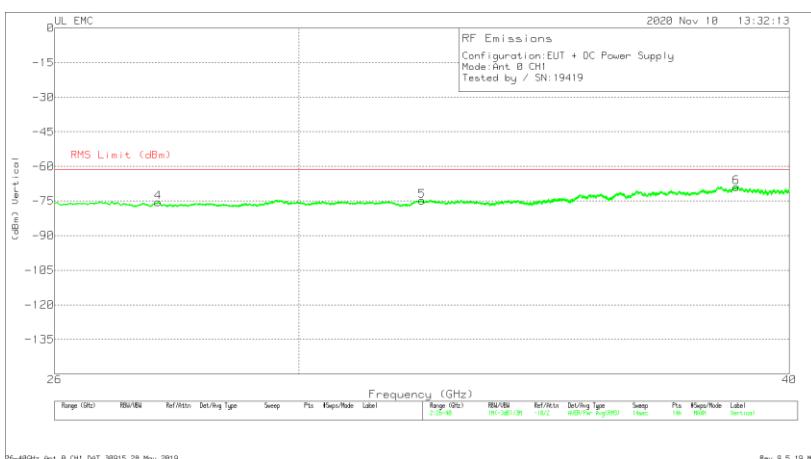
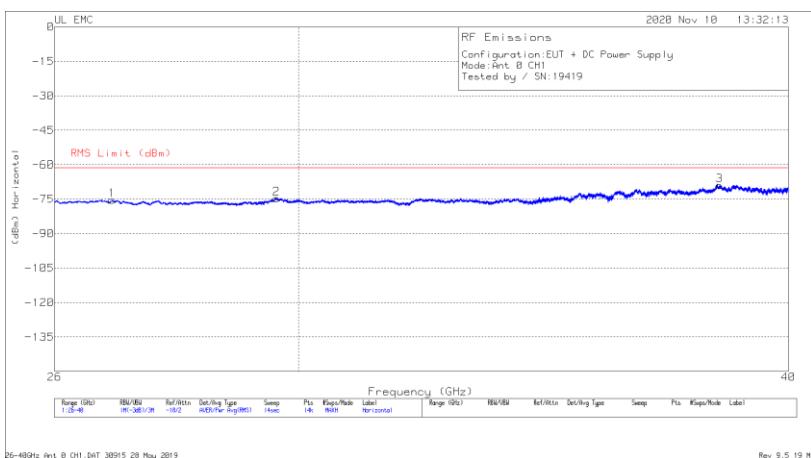
Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	T125 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)
1	19.369	-81.89	RMS	32.6	-18.8	-15.6	11.8	-71.89	-61.3	-10.59
2	22.11	-81.07	RMS	33.4	-20.1	-15.6	11.8	-71.57	-61.3	-10.27
3	25.956	-79.28	RMS	34.5	-20.5	-15.6	11.8	-69.08	-61.3	-7.78
4	19.387	-82.01	RMS	32.6	-19	-15.6	11.8	-72.21	-61.3	-10.91
5	22.138	-81.09	RMS	33.4	-20.2	-15.6	11.8	-71.69	-61.3	-10.39
6	25.967	-79.04	RMS	34.4	-20.5	-15.6	11.8	-68.94	-61.3	-7.64

RMS - RMS detection

## 8.5.6. AVERAGE EMISSIONS, 26 – 40 GHz

### Channel 1

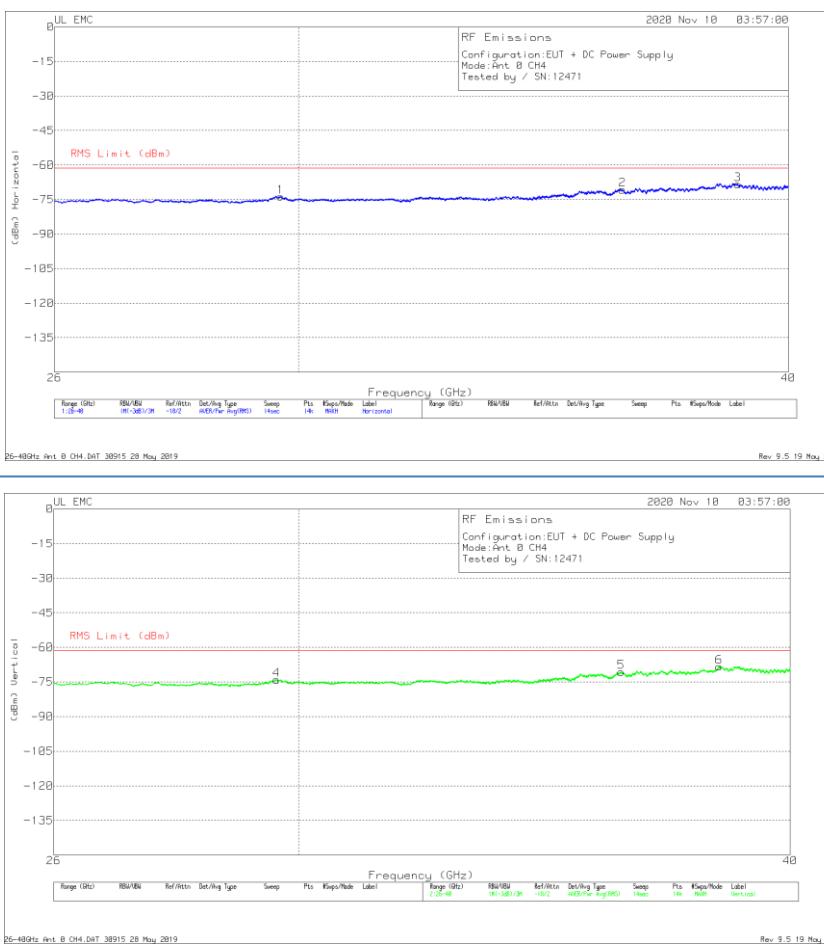


### Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0182203 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	Corrected Reading (dBm)	Avg Limit (dBm)	Margin (dB)
1	26.891	-77.24	RMS	35.8	-30.1	-15.6	11.8	-75.34	-61.3	-14.04
2	29.617	-81.01	RMS	37.3	-27.2	-15.6	11.8	-74.71	-61.3	-13.41
3	38.414	-78.35	RMS	38.3	-25.1	-15.6	11.8	-68.95	-61.3	-7.65
4	27.624	-78.46	RMS	35.8	-29	-15.6	11.8	-75.46	-61.3	-14.16
5	32.248	-80.08	RMS	37	-27.9	-15.6	11.8	-74.78	-61.3	-13.48
6	38.774	-78.28	RMS	38.3	-25.2	-15.6	11.8	-68.98	-61.3	-7.68

RMS - RMS detection

Channel 4



Marker	Frequency (GHz)	Meter Reading (dBm)	Det	PRE0182203 AF (dB/m)	Amp/Cbl (dB)	Dist Corr (dB)	Conversion Factor (dB)	Corrected Reading (dBm)	RMS Limit (dBm)	Margin (dB)
1	29.686	-80.1	RMS	37.5	-27.3	-15.6	11.8	-73.7	-61.3	-12.4
2	36.284	-78.42	RMS	37.6	-26	-15.6	11.8	-70.62	-61.3	-9.32
3	38.83	-77.77	RMS	38.3	-25.1	-15.6	11.8	-68.37	-61.3	-7.07
4	29.618	-80.34	RMS	37.3	-27.2	-15.6	11.8	-74.04	-61.3	-12.74
5	36.234	-78.42	RMS	37.6	-26	-15.6	11.8	-70.62	-61.3	-9.32
6	38.37	-77.94	RMS	38.3	-24.9	-15.6	11.8	-68.34	-61.3	-7.04

RMS - RMS detection