



CERTIFICATION TEST REPORT

Report Number. : 12520944-E2V1

Applicant : End2End Sensors LLC
170 S Green Valley Parkway, Ste 300
Henderson, Nevada 89012
U.S.A.

Model : E2E-BLE-GL1

FCC ID : 2ARQY-E2EBLEGL1

EUT Description : Bluetooth Low Energy enabled temperature logging device

Test Standard(s) : FCC 47 CFR PART 15 SUBPART B

Date Of Issue:

February 21, 2019

Prepared by:

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



Revision History

Rev.	Issue Date	Revisions	Revised By
V1	02/21/2019	Initial Issue	---

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS	4
2. TEST METHODOLOGY.....	5
3. FACILITIES AND ACCREDITATION.....	5
4. CALIBRATION AND UNCERTAINTY	6
4.1. MEASURING INSTRUMENT CALIBRATION.....	6
4.2. SAMPLE CALCULATION.....	6
4.3. MEASUREMENT UNCERTAINTY	6
5. EQUIPMENT UNDER TEST	7
5.1. DESCRIPTION OF EUT	7
5.2. TEST CONFIGURATIONS	7
5.3. MODE(S) OF OPERATION	7
5.4. SOFTWARE AND FIRMWARE	7
5.5. MODIFICATIONS	7
5.6. DESCRIPTION OF TEST SETUP	8
6. TEST AND MEASUREMENT EQUIPMENT	10
7. APPLICABLE EMISSIONS LIMITS AND TEST RESULTS	11
7.1. RADIATED EMISSIONS LIMITS AND RESULTS	11
7.1.1. RADIATED EMISSIONS 30 TO 1000 MHz.....	12
7.1.2. RADIATED EMISSIONS 1GHz to 18GHz.....	14
8. SETUP PHOTOS	16

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: End2End Sensors LLC
170 S Green Valley Parkway, Ste 300
Henderson, Nevada 89012
U.S.A.

EUT DESCRIPTION: Bluetooth Low Energy enabled temperature logging device

MODEL: E2E-BLE-GL1

SERIAL NUMBER: 2050054

DATE TESTED: FEBRUARY 1, 2019

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC 47 CFR PART 15 SUBPART B	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:



Frank Ibrahim
CONSUMER TECHNOLOGY DIVISION
Operations Leader
UL Verification Services Inc.

Prepared By:



Eric Yu
CONSUMER TECHNOLOGY DIVISION
Test Engineer
UL Verification Services Inc.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2014.

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

Where relevant, the following sample calculation is provided:

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

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.84 dB
Conducted Disturbance, 0.15 to 30 MHz	3.65 dB
Radiated Disturbance, 9KHz to 30 MHz	3.15 dB
Radiated Disturbance, 30 to 1000 MHz	5.36 dB
Radiated Disturbance, 1000 to 18000 MHz	4.32 dB
Radiated Disturbance, 18000 to 26000 MHz	4.45 dB
Radiated Disturbance, 26000 to 40000 MHz	5.24 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Bluetooth Low Energy enabled temperature logging device. Sealed inside plastic enclosure containing two AAA alkaline batteries.

GENERAL INFORMATION

Highest frequency generated or used by the EUT	2480 MHz
Power Requirements	3.3V DC

5.2. TEST CONFIGURATIONS

The following configuration was tested:

EUT Configuration	Description
Normal	The EUT is connected to two AAA alkaline batteries

5.3. MODE(S) OF OPERATION

Mode	Description
Normal Mode	The EUT was exercised during testing

5.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was V0.9

The test utility software used during testing was radio_test_0_1

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

N/A

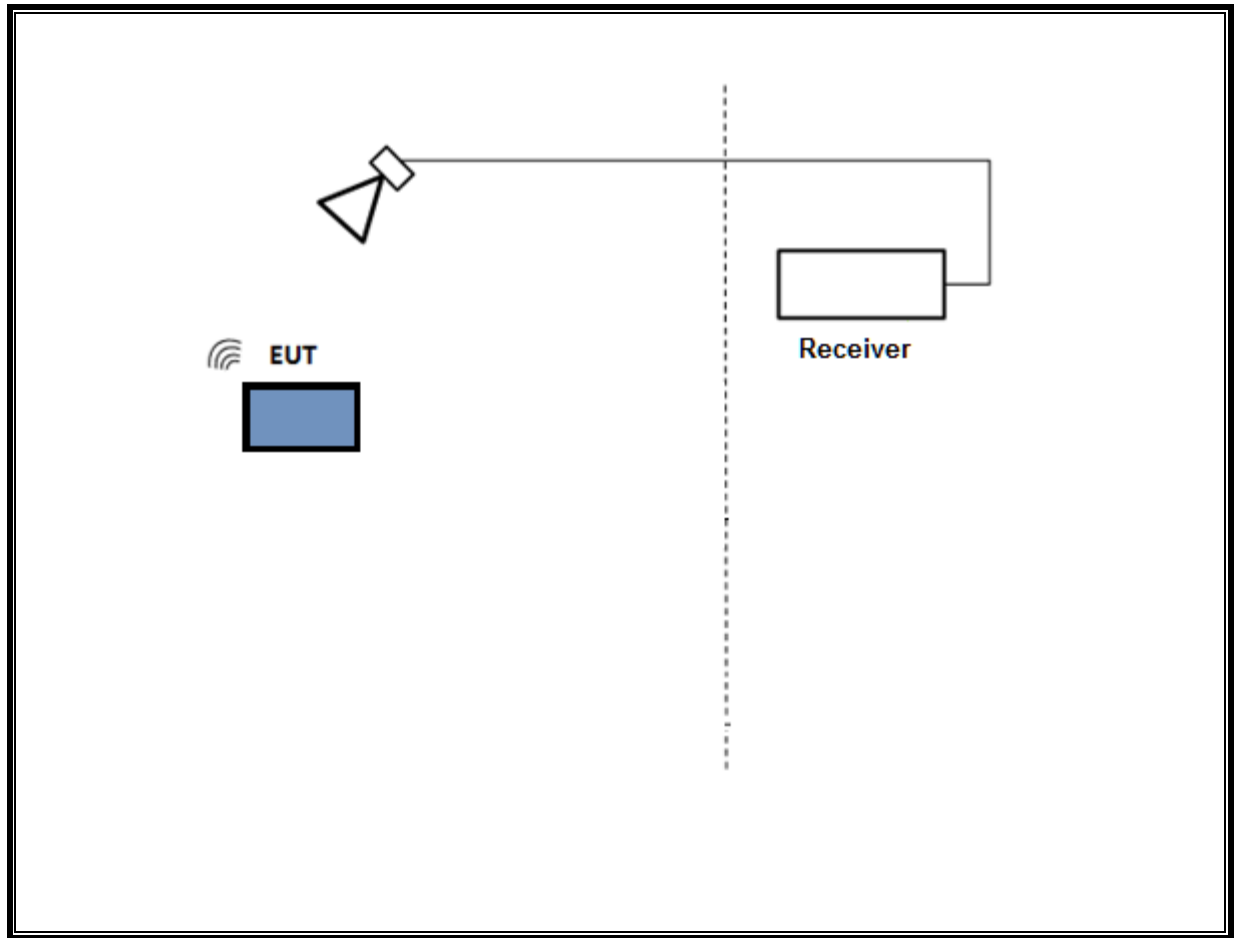
I/O CABLES

N/A

TEST SETUP

The EUT is connected to two AAA alkaline batteries.

SETUP DIAGRAM FOR TESTS



6. 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	Asset	Cal Due
Antenna, Broadband Hybrid, 30MHz to 3000MHz	SunAR RF Motion	JB3	PRE0184971	11/13/2019
Amplifier, 10KHz to 1GHz, 32dB	SONOMA INSTRUMENT	310	PRE0180175	07/09/2019
Antenna, Horn 1-18GHz	ETS Lindgren	3117	T862	05/24/2019
Amplifier, 1 to 18GHz	MITEQ	AFS42-00101800-25-S-42	PRE1782151	08/01/2019
EMI Test Receiver	Rohde&Schwarz	ESW44	PRE0179376	05/08/2019
UL AUTOMATION SOFTWARE				
Radiated Software	UL	UL EMC	Ver 9.5, June 22, 2018	

7. APPLICABLE EMISSIONS LIMITS AND TEST RESULTS

7.1. RADIATED EMISSIONS LIMITS AND RESULTS

LIMIT

FCC Part 15 Subpart B

§15.109 (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Limits for radiated disturbance of Class B ITE at measuring distance of 3 m	
Frequency range (MHz)	Quasi-peak limits (dBμV/m)
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960 MHz	54
Note: The lower limit shall apply at the transition frequency.	

TEST PROCEDURE

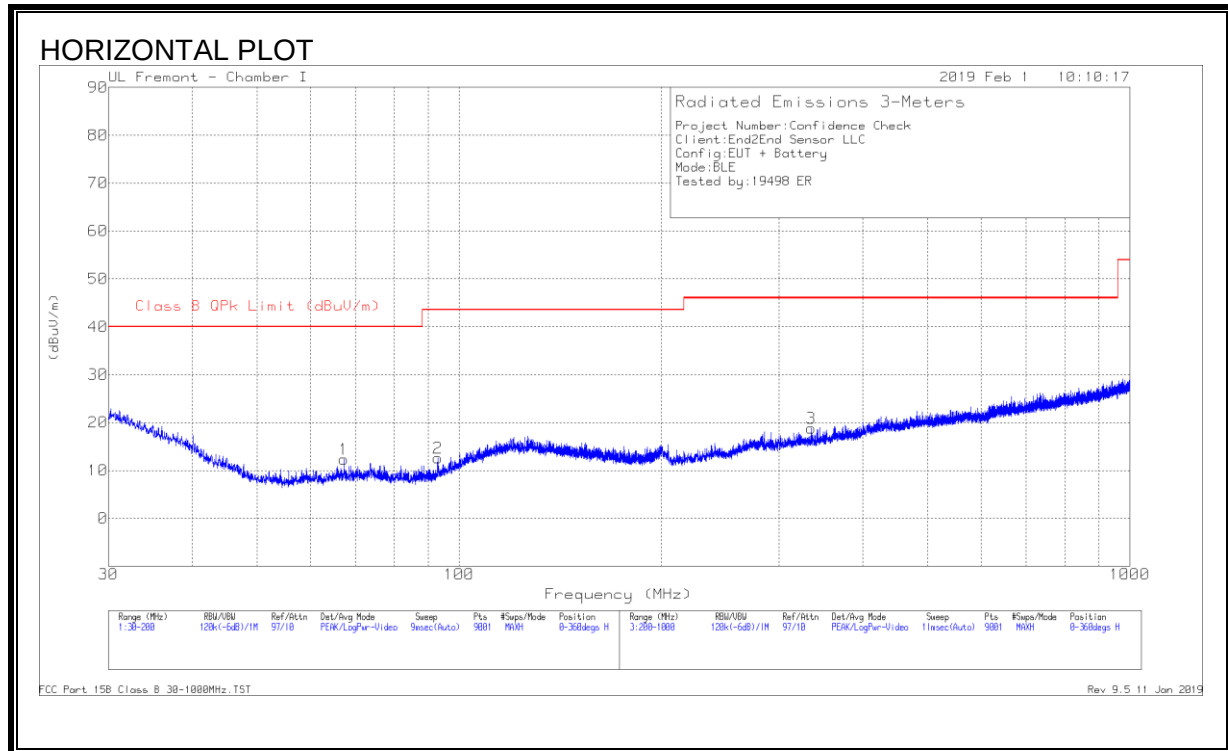
ANSI C63.4: 2014

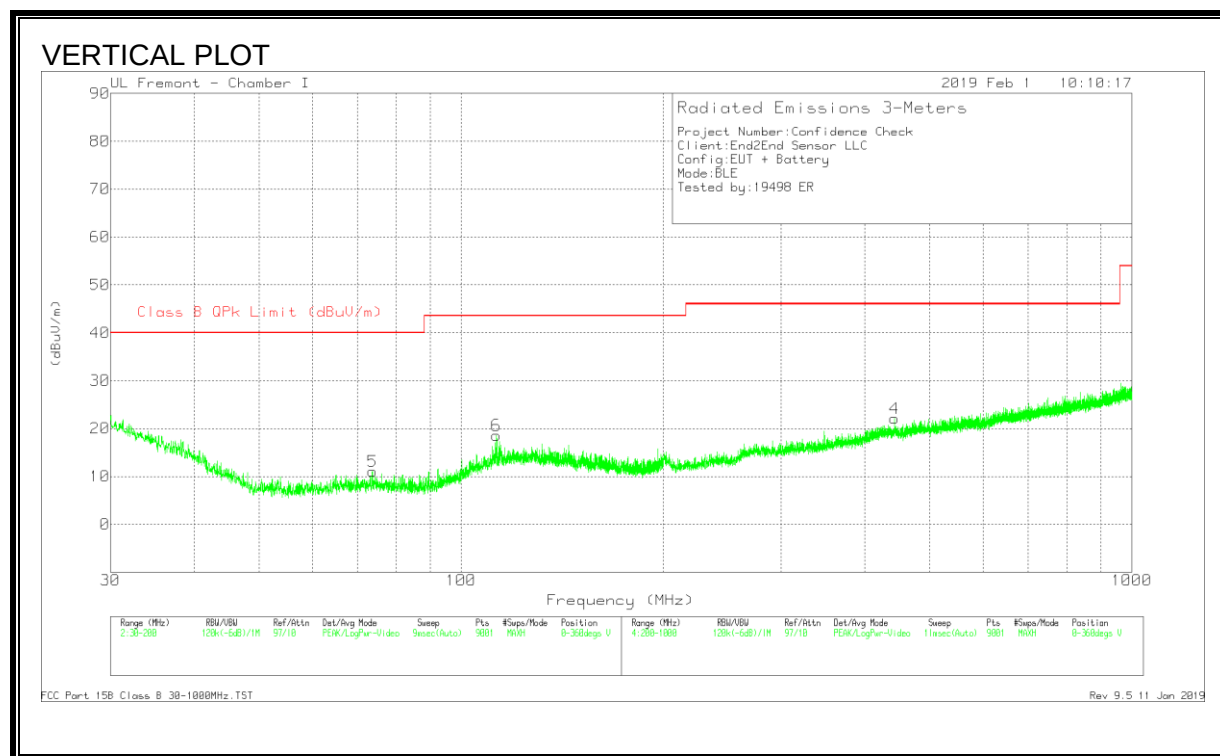
The highest frequency generated or used in the EUT is 2480 MHz therefore the frequency range was investigated from 30 MHz to 18 GHz.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1000
108-500	2000
500-1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

RESULTS

7.1.1. RADIATED EMISSIONS 30 TO 1000 MHz



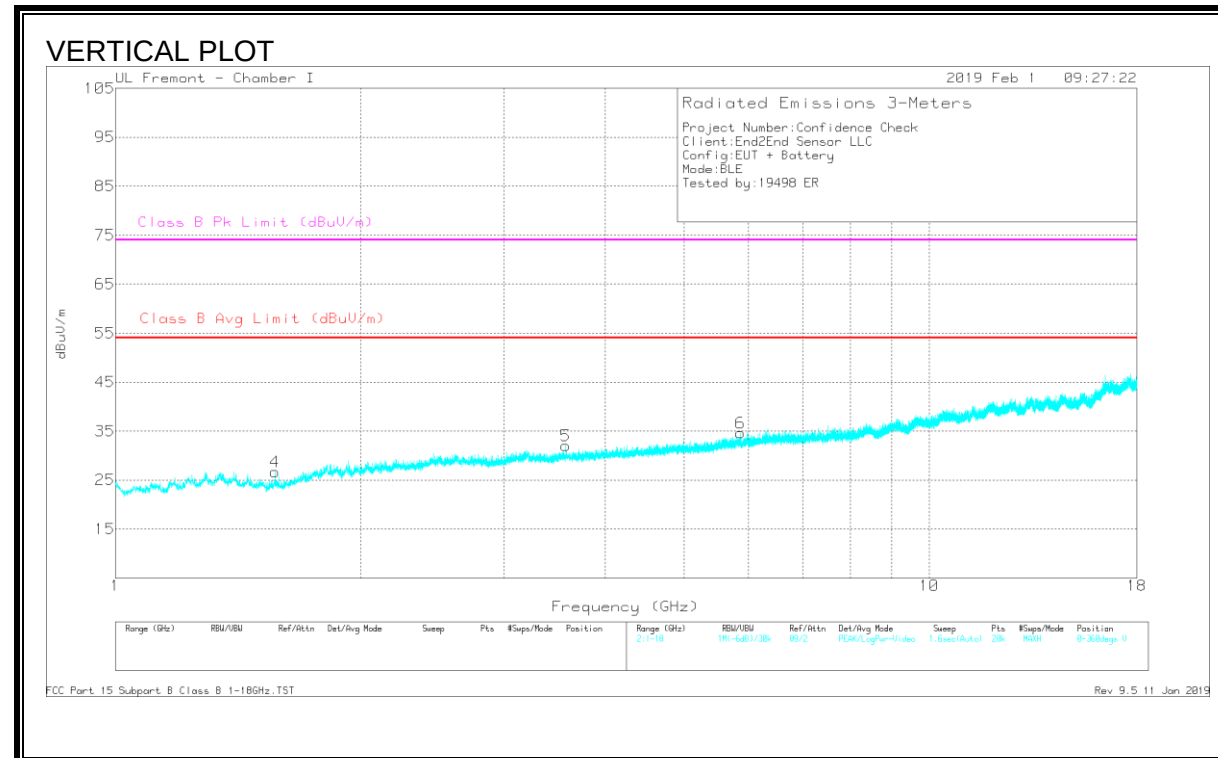
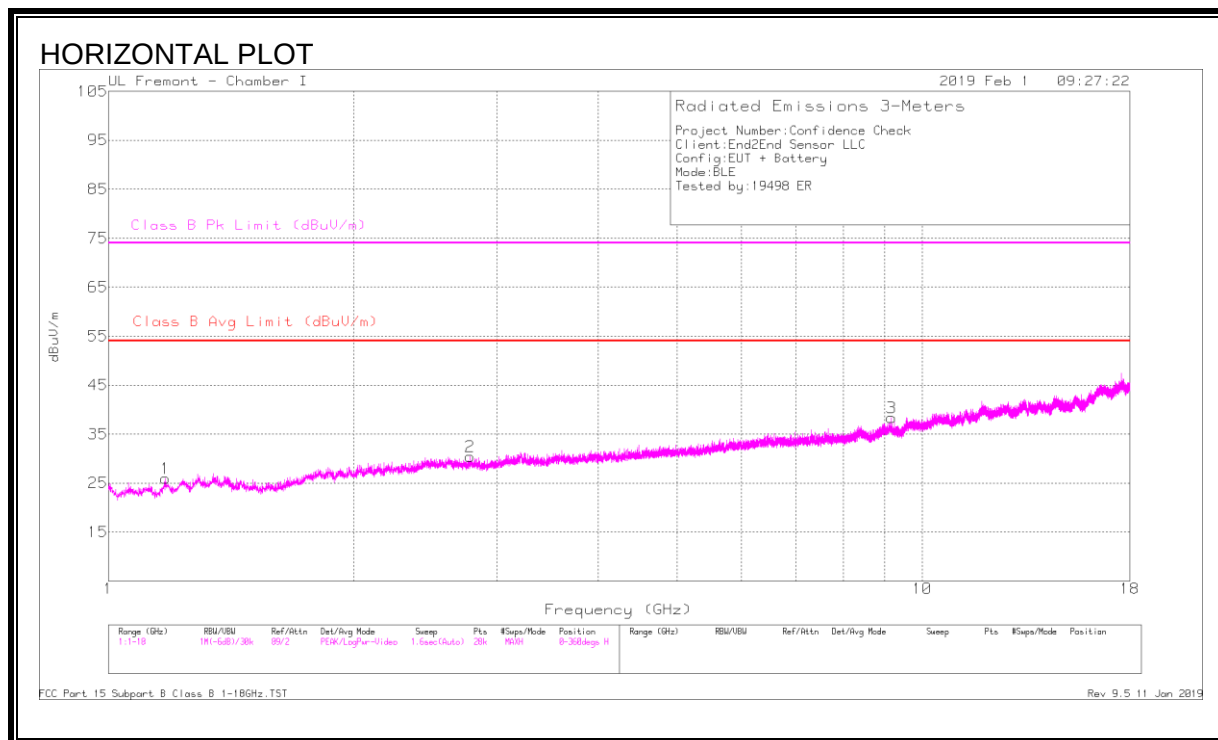


Radiated Emissions

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AF PRE0184971 (dB/m)	Amp Cbl (dB)	Corrected Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	67.3436	29.58	Pk	13.8	-31	12.38	40	-27.62	0-360	99	H
2	92.9004	29.22	Pk	14.2	-30.8	12.62	43.52	-30.9	0-360	399	H
5	73.7091	28.13	Pk	13.9	-31	11.03	40	-28.97	0-360	101	V
6	112.866	30.43	Pk	18.9	-30.7	18.63	43.52	-24.89	0-360	101	V
3	335.1113	28.62	Pk	19.9	-29.7	18.82	46.02	-27.2	0-360	300	H
4	442.5781	29.05	Pk	22.6	-29.5	22.15	46.02	-23.87	0-360	300	V

Pk - Peak detector

7.1.2. RADIATED EMISSIONS 1GHz to 18GHz



HORIZONTAL AND VERTICAL DATA**Trace Markers**

Frequency (GHz)	Meter Reading (dBuV)	Det	AF T862 (dB/m)	Amp/Cbl (dB)	Corrected Reading dBuV/m	Class B Avg Limit (dBuV/m)	Margin (dB)	Class B Pk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1.175	41.23	Pk	27.8	-34.2	34.83	-	-	74	-39.17	290	373	H
1.175	27.9	Av	27.8	-34.2	21.5	54	-32.5	-	-	290	373	H
2.783	38.9	Pk	32.4	-31.5	39.8	-	-	74	-34.2	257	381	H
2.782	25.19	Av	32.4	-31.5	26.09	54	-27.91	-	-	257	381	H
9.171	33.26	Pk	36.3	-22.7	46.86	-	-	74	-27.14	286	238	H
9.171	19.97	Av	36.3	-22.7	33.57	54	-20.43	-	-	286	238	H
1.57	39.49	Pk	28	-33.3	34.19	-	-	74	-39.81	353	197	V
1.572	26.63	Av	28	-33.3	21.33	54	-32.67	-	-	353	197	V
3.575	37.33	Pk	33.1	-30.1	40.33	-	-	74	-33.67	34	260	V
3.577	24.1	Av	33.1	-30.2	27	54	-27	-	-	34	260	V
5.859	36.36	Pk	35.2	-27.9	43.66	-	-	74	-30.34	4	115	V
5.861	22.55	Av	35.2	-27.9	29.85	54	-24.15	-	-	4	115	V

Pk - Peak detector

Av - Average detection