

TEST REPORT

Report Number: R15339867-E2

Applicant : Energous Corporation
3590 North First Street, Suite 210
San Jose, CA 95134, USA

Model : YND-1800

FCC ID : 2ADNG-YND1800

EUT Description : Wireless Charger

Test Standard(s) : FCC 47 CFR PART 18 SUBPART C

Date Of Issue:

2024-07-17

Prepared by:

UL LLC

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
1	2024-07-17	Initial Issue	Noah Bennett

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Energous Corporation
3590 North First Street, Suite 210
San Jose, CA 95134, USA

EUT DESCRIPTION: Wireless Charger

MODEL: YND-1800

SERIAL NUMBER: Yondu 040A

SAMPLE RECEIPT DATE: 2024-06-17

DATE TESTED: 2024-06-13 & 2024-06-14

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 18 SUBPART C	See Test Results

UL LLC 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 LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document.

Approved & Released
For UL LLC By:

Prepared By:



Jeff Moser
Operations Manager
Consumer, Medical and IT Segment
UL LLC



Noah Bennett
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Consumer, Medical and IT Segment
UL LLC

2. SUMMARY OF TEST RESULTS

This report contains data provided by the customer which can impact the validity of results. UL LLC is only responsible for correctly integrating customer-provided data with measurements performed by UL LLC. Below is a list of the data provided by the customer:

1. EUT Operating power and frequency (section 6.1)
2. Source and Client Max RF Energy Generated (section 6.2)
3. Antenna gain and type (see section 6.3)

FCC Clause	Requirement	Result	Comment
18.301	Operating Frequency	-	The EUT operates within the 915 MHz ISM band.
18.303	Prohibited frequency bands.	-	The EUT does not operate within the frequencies listed in 18.303.
18.305 (b)	Field Strength Limits	Complies	None.
18.307 (b)	AC Mains Conducted Emissions	Complies	None
18.309	Frequency Range of Measurements	-	The EUT was measured to the 10 th harmonic or 10 GHz.
18.311	Methods of Measurements	-	FCC MP-5:1986 was used.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with:

- FCC Part 18 Subpart C and
- FCC / OST MP-5:1986, "FCC Method of Measurements of Radio Noise Emission From Industrial, Scientific, and Medical Equipment".

4. FACILITIES AND ACCREDITATION

UL LLC is accredited by A2LA, certification # 0751.06, for all testing performed within the scope of this report. Testing was performed at the locations noted below.

	Address	ISED CABID	ISED Company Number	FCC Registration
<input type="checkbox"/>	Building: 12 Laboratory Dr RTP, NC 27709, U.S.A	US0067	2180C	825374
<input checked="" type="checkbox"/>	Building: 2800 Perimeter Park Dr, Suite B Morrisville, NC 27560, U.S.A		27265	

5. DECISION RULES AND MEASUREMENT UNCERTAINTY

5.1. 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.

5.2. 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.)

5.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	U _{Lab}
All emissions, radiated	6.01 dB
Conducted Emissions (0.150-30MHz) - LISN	3.40 dB
Temperature	0.57°C
Humidity	3.39%
DC Supply voltages	1.70%

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

5.4. SAMPLE CALCULATION

RADIATED EMISSIONS

Where relevant, the following sample calculation is provided:

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

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

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

6. EQUIPMENT UNDER TEST

6.1. EUT DESCRIPTION

The EUT is an over-the-air, at a distance charging transmitter with WPT and BLE. The wireless charger transmits power via a 52-tone frequency hopping signal in range 907MHz-920MHz and charges multiple receivers at a time. The EUT uses BLE to communicate with a client device. The EUT can be powered via 12W USB-C, 12VDC Power Supply, or a PoE.

The WPT portion of the EUT is a frequency hopping transmitter in the ISM band on the 3 channels as follows:

- 911.68MHz
- 913.5MHz
- 915.5MHz

6.2. MAXIMUM RF ENERGY

The source transmitter, as tested has a maximum RF Energy of 2 Watts, 33dBm.

The client device, as tested has a maximum RF Energy of 3mW, 4.77dBm.

6.3. DESCRIPTION OF AVAILABLE ANTENNAS

The antenna(s) gain and type, as provided by the manufacturer' are as follows:

The radio utilizes a dual polarized patch antenna, with a maximum gain of 6.5dBi.

6.4. SOFTWARE AND FIRMWARE

The EUT firmware installed during testing was 6.0.1.19_2200_sdk_17.

6.5. WORST-CASE CONFIGURATION AND MODE

The fundamental of the EUT was investigated in three orthogonal orientations X,Y,Z, it was determined that Y orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Y orientation.

The EUT supports 3 input power methods, DC Power Supply, Power over Ethernet (PoE), and USB. These modes were investigated to determine the worst-case. It was determined that USB mode was worst case. Therefore, all final radiated testing was performed with the EUT powered via USB.

AC Line emissions were performed on all 3 input power methods the worst-case channel.

6.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
AC adapter	HDP	HDP12-MD05024U	N/A	N/A
POE Injector	Cisco	DPSN-35FBA	DCA183510NA	N/A
Power Supply	Circuit Specialists	CSI3005X5	N/A	N/A
Support Laptop	Dell	Precision 5520	FK7QHM2	N/A
IOT Sensor	Energous	N/A	IOT-21DE	N/A
IOT Sensor	Energous	N/A	IOT-21DF	N/A

I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	USB	1	USB-C	shielded	<3m	
2	Ethernet	1	RJ45	unshielded	<3m	

TEST SETUP

The EUT was connected to USB via an AC adapter for power. The EUT was set to transmit at the max charging rate for the entire tests.

SETUP DIAGRAMS

Please refer to R15339687-EP2 for setup diagrams

7. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville – Chamber 4)

Equip. ID	Description	Manufacturer/Brand	Model Number	Last Cal.	Next Cal.
	0.009-30MHz				
135144	Active Loop Antenna	ETS-Lindgren	6502	2024-01-24	2025-01-24
	30-1000 MHz				
90628	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2024-01-02	2026-01-02
	1-18 GHz				
89509	Double-Ridged Waveguide Horn Antenna, 1 to 18 GHz	ETS Lindgren	3117	2023-05-23	2025-05-23
	Gain-Loss Chains				
207638	Gain-loss string: 0.009-30MHz	Various	Various	2024-05-22	2025-05-22
207639	Gain-loss string: 25-1000MHz	Various	Various	2024-05-22	2025-05-22
207640	Gain-loss string: 1-18GHz	Various	Various	2024-05-22	2025-05-22
	Receiver & Software				
197955	Spectrum Analyzer	Rohde & Schwarz	ESW44	2024-04-16	2025-04-16
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Additional Equipment used				
241204	Environmental Meter	Fisher Scientific	15-077-963	2023-09-05	2025-09-05
167153 (BRF007)	902-928MHz notch filter, 2W, Fhigh =1.5GHz	Micro-Tronics	BRC17691	2024-03-01	2025-03-01
82635 (HPF009)	1GHz high-pass filter, 2W, Fhigh =10GHz	Micro-Tronics	HPM17672	2024-03-01	2025-03-01

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2024-04-04	2025-04-04
179892	Environmental Meter	Fisher Scientific	15-077-963	2023-07-26	2024-06-31
80391	LISN, 50-ohm/50-uH, 250uH 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50/250-25-2-01	2023-07-31	2024-07-31
75141	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2023-08-01	2024-08-01
52859	Transient Limiter, 0.009-100MHz	Electro-Metrics	EM-7600	2024-04-04	2025-04-04
PS216	AC Power Source	Elgar	CW2501M	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5 (18 Oct 2021)		
	Miscellaneous (if needed)				
84681	ANSI C63.4 1m extension cable.	UL	Per Annex B of ANSI C63.4	2024-04-04	2025-04-04

8. RADIATED EMISSIONS TEST RESULTS

LIMIT

§18.305 (b) The field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following:

Equipment	Operating frequency Distance	RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500 500 or more	25 $25 \times \text{SQRT}(\text{power}/500)$	300
	Any non-ISM frequency	Below 500 500 or more	15 $15 \times \text{SQRT}(\text{power}/500)$	300

The EUT operates from 907MHz – 920MHz, which is in tolerance of the ISM frequency of 915 +/- 13MHz.

Formula for converting the filed strength from uV/m to dBuV/m is:

$$\text{Limit (dBuV/m)} = 20 \log \text{limit (uV/m)}$$

TEST PROCEDURE

Tesed in accordance with FCC / OST MP-5

The fundamental clock frequency generated or used in the EUT is 920MHz MHz; therefore the frequency range was investigated from 30 MHz to 10GHz or the 10th harmonic.

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 in the 30-1000MHz range.

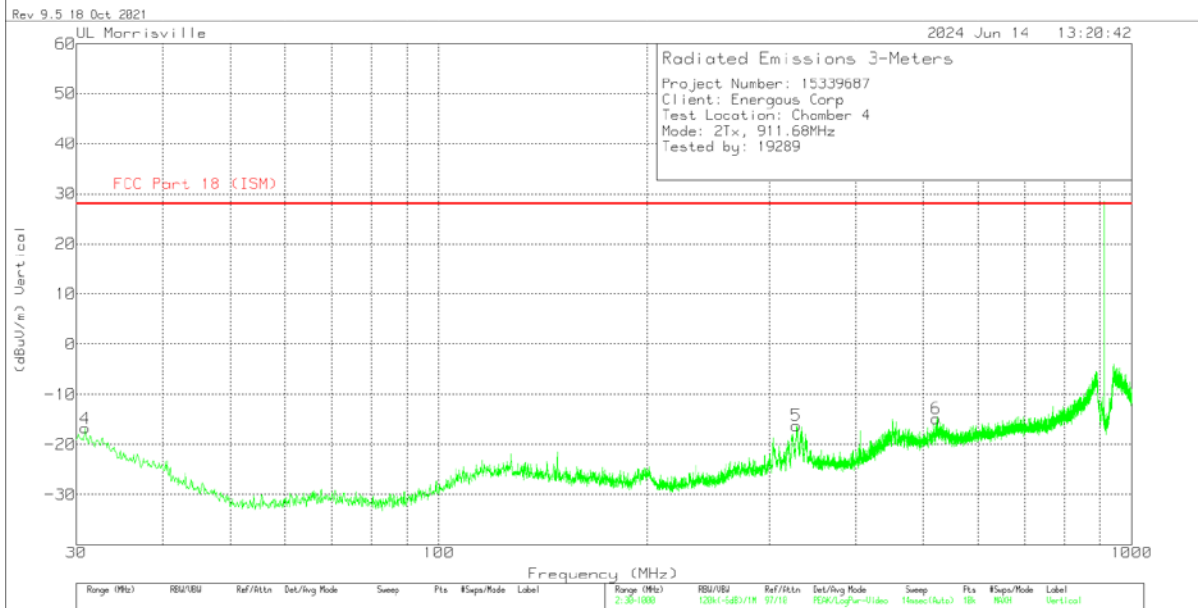
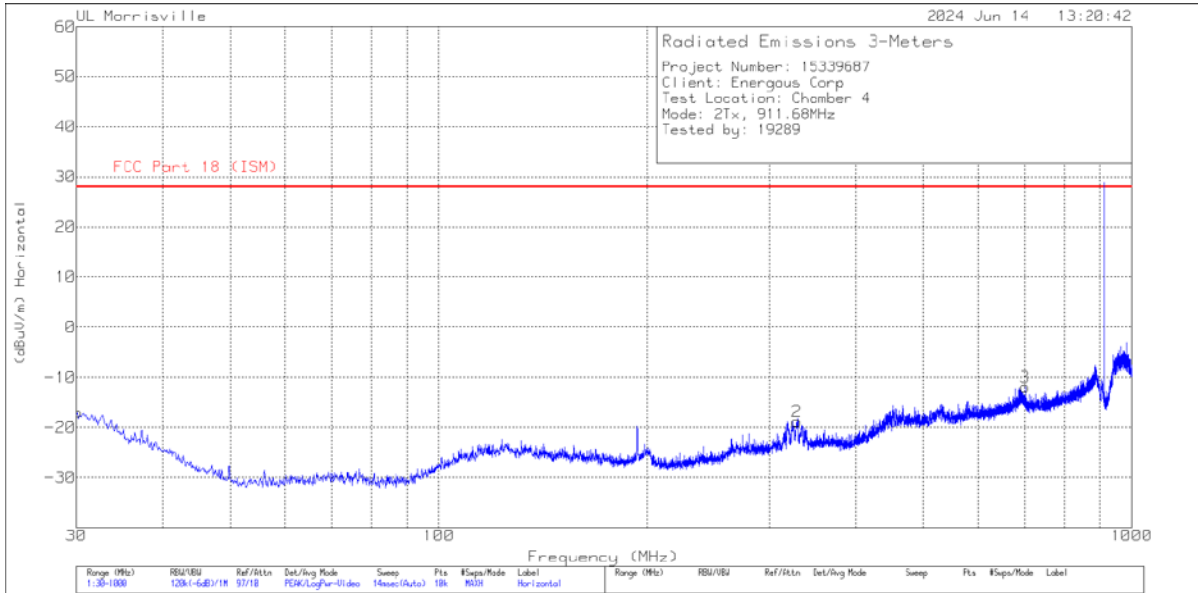
For pre-scans above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements. For final measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements and as applicable for average measurements. The average detector was used.

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.

RESULTS

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

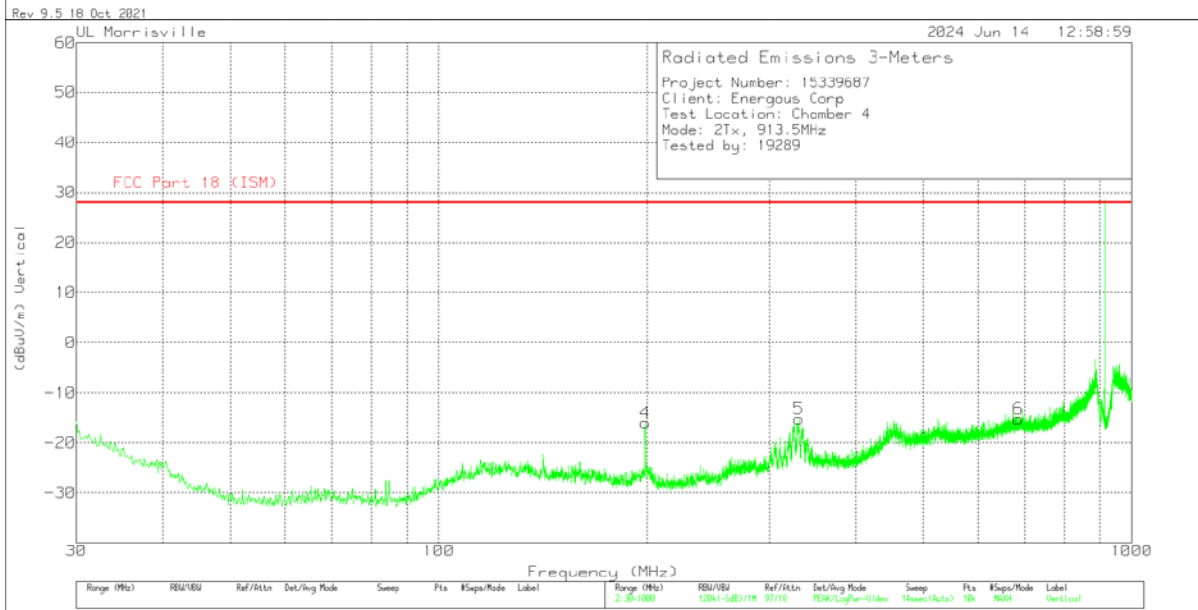
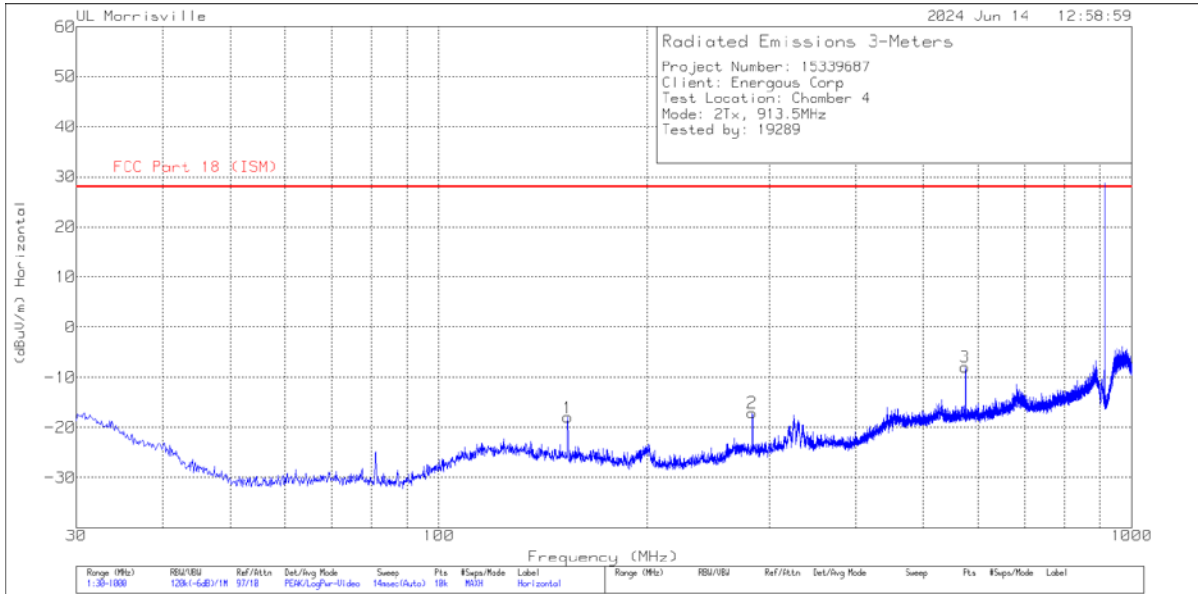
8.1.1. Low Channel



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90628 (dB/m)	Gain/Loss (dB)	DCF (dB)	Filter (dB)	Corrected Reading (dBuV/m)	FCC Part 18 (ISM)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.097	28.27	Pk	26.8	-32.1	-40	.1	-16.93	28	-44.93	0-360	300	H
4	30.873	28.91	Pk	26.3	-32.1	-40	.1	-16.79	28	-44.79	0-360	100	V
5	328.178	33.44	Pk	20.1	-30.1	-40	.3	-16.26	28	-44.26	0-360	100	V
2	328.857	30.99	Pk	20	-30.1	-40	.3	-18.81	28	-46.81	0-360	100	H
6	521.79	30.5	Pk	23.9	-29.6	-40	.4	-14.8	28	-42.8	0-360	100	V
3	701.628	30.09	Pk	26.2	-28.8	-40	.5	-12.01	28	-40.01	0-360	100	H

Pk - Peak detector

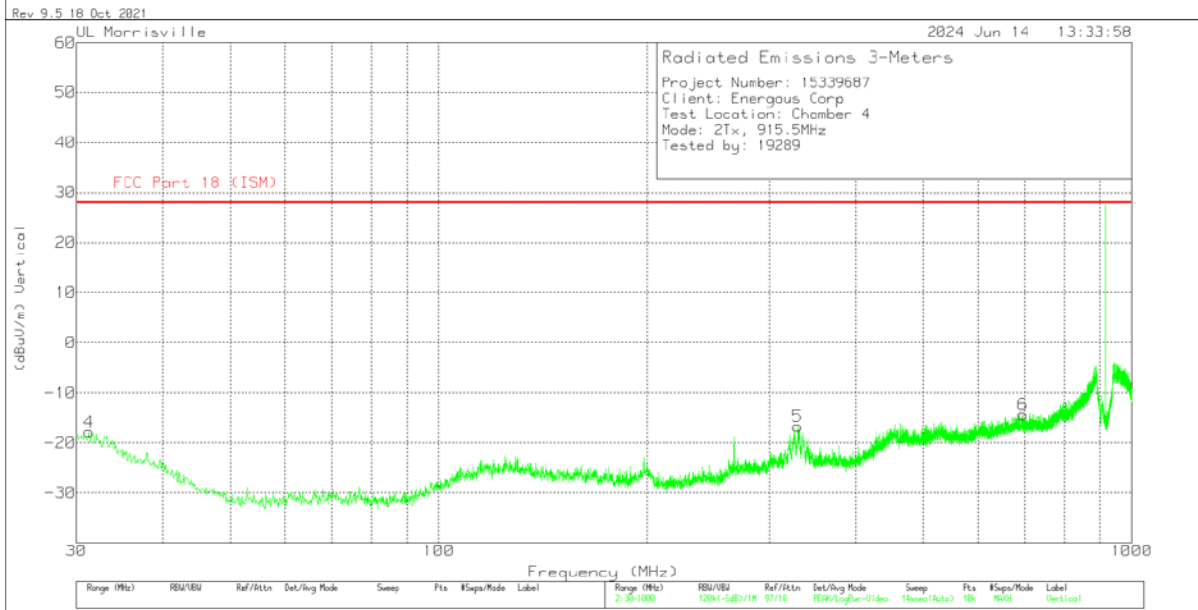
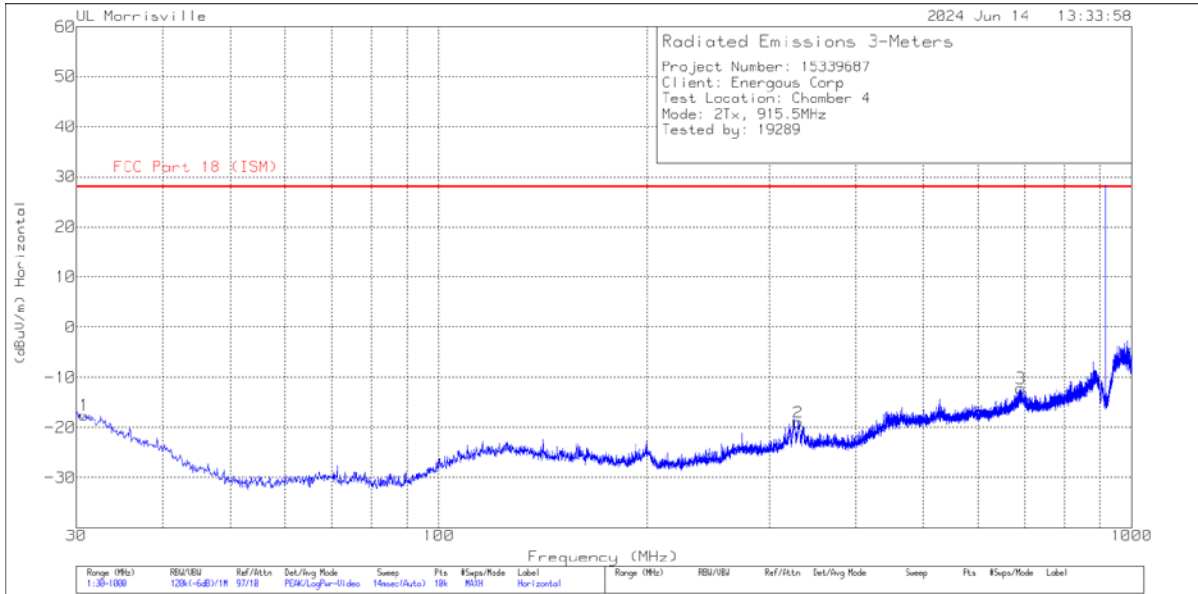
8.1.2. Mid Channel



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90628 (dB/m)	Gain/Loss (dB)	DCF (dB)	Filter (dB)	Corrected Reading (dBuV/m)	FCC Part 18 (ISM)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	153.481	34.26	Pk	18.6	-31.1	-40	.2	-18.04	28	-46.04	0-360	200	H
4	198.586	35.67	Pk	18.8	-30.8	-40	.3	-16.03	28	-44.03	0-360	100	V
2	283.267	33.27	Pk	19.5	-30.2	-40	.3	-17.13	28	-45.13	0-360	100	H
5	330.7	34.49	Pk	20.1	-30.1	-40	.3	-15.21	28	-43.21	0-360	100	V
3	575.14	36.24	Pk	24.6	-29.3	-40	.5	-7.96	28	-35.96	0-360	100	H
6	686.011	27.24	Pk	26	-29	-40	.5	-15.26	28	-43.26	0-360	100	V

Pk - Peak detector

8.1.3. High Channel

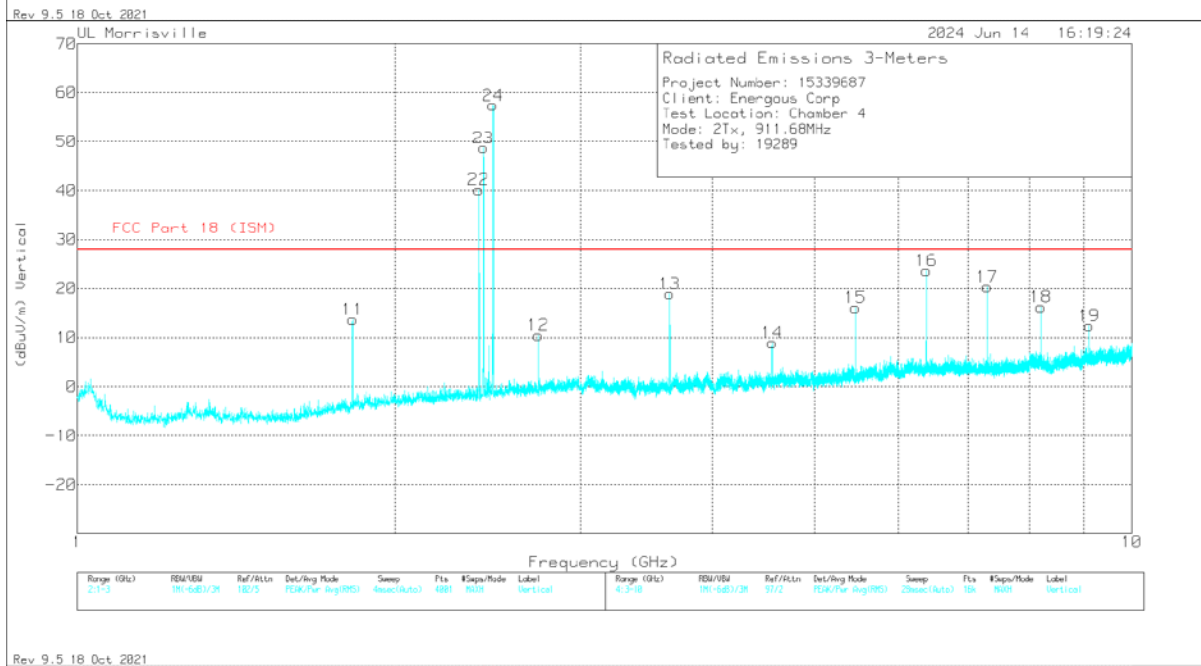
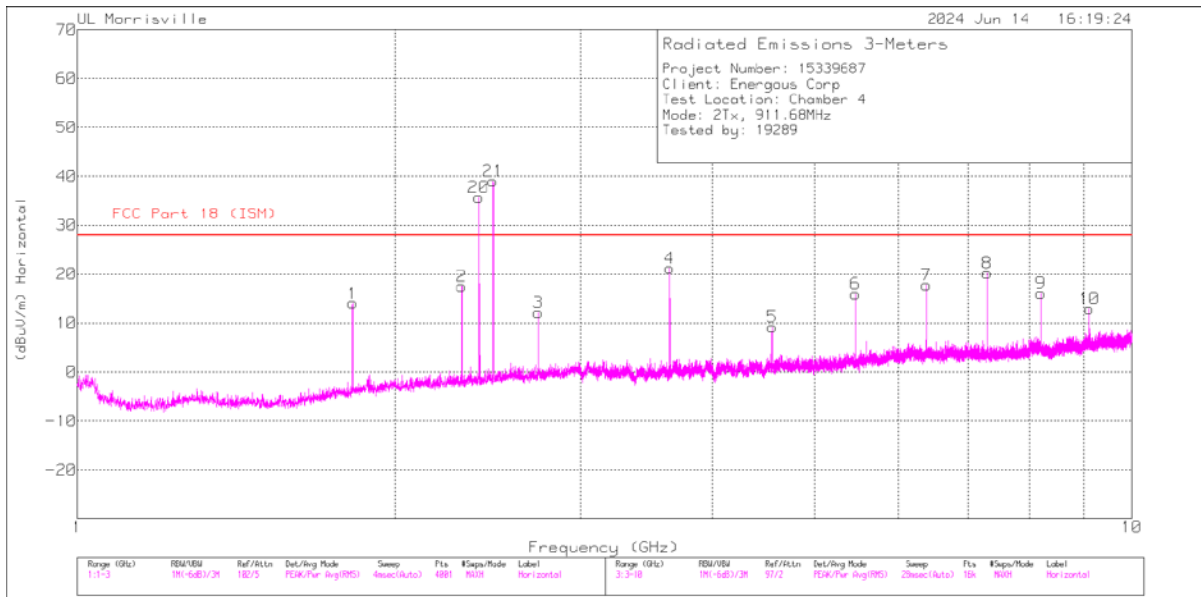


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	90628 (dB/m)	Gain/Loss (dB)	DCF (dB)	Filter (dB)	Corrected Reading (dBuV/m)	FCC Part 18 (ISM)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.776	28.15	Pk	26.3	-32.1	-40	.1	-17.55	28	-45.55	0-360	300	H
4	31.261	28.15	Pk	26	-32.1	-40	.1	-17.85	28	-45.85	0-360	100	V
5	329.633	33.09	Pk	20	-30.1	-40	.3	-16.71	28	-44.71	0-360	100	V
2	330.118	30.67	Pk	20.1	-30.1	-40	.3	-19.03	28	-47.03	0-360	100	H
3	691.443	29.99	Pk	26.2	-28.9	-40	.5	-12.21	28	-40.21	0-360	100	H
6	696.487	27.79	Pk	26.2	-28.8	-40	.5	-14.31	28	-42.31	0-360	100	V

Pk - Peak detector

8.2. SPURIOUS EMISSIONS ABOVE 1GHz (WORST-CASE CONFIGURATION)

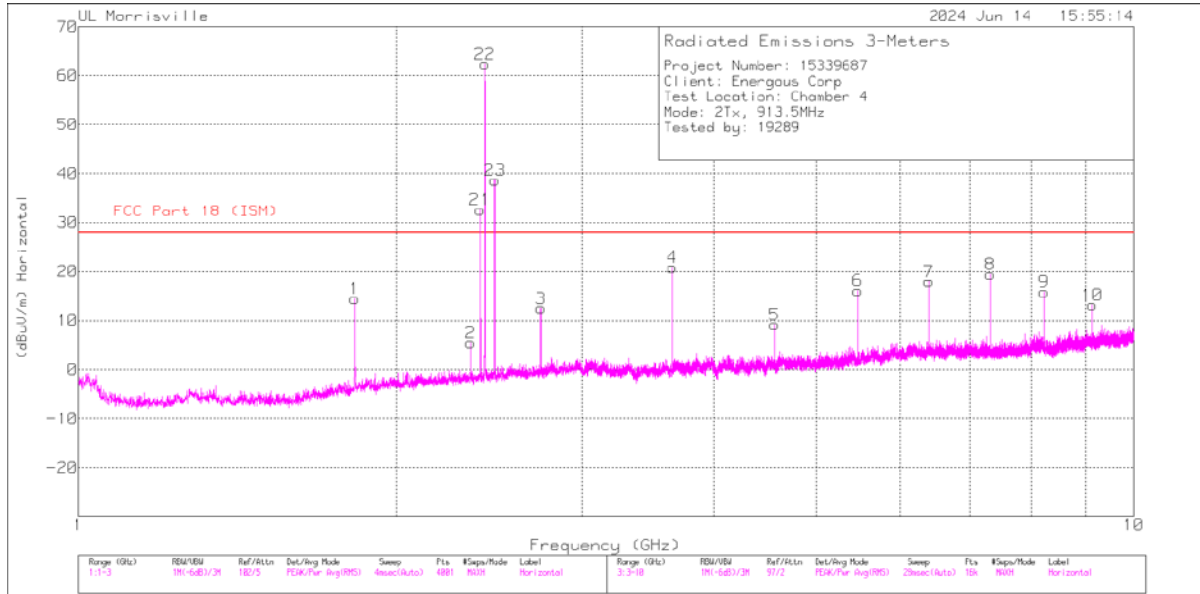
8.2.1. Low Channel



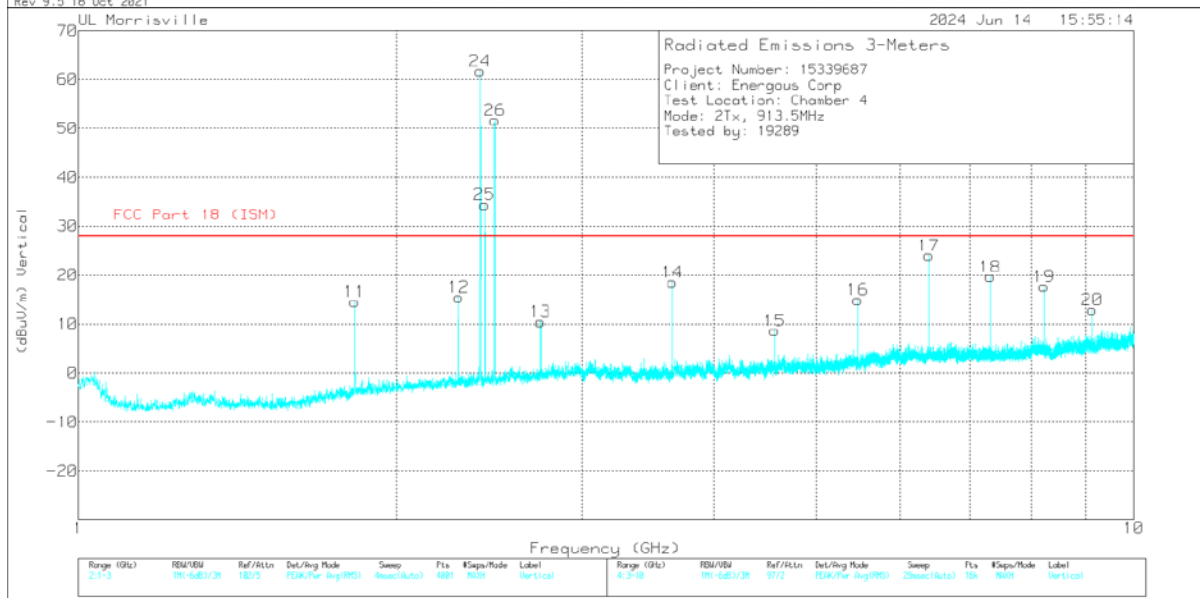
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Filter (dB)	DCF (dB)	Corrected Reading (dBuV/m)	FCC Part 18 (ISM)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.8235	47.22	Pk	30.2	-23.8	.4	-40	14.02	28	-13.98	0-360	100	H
2	2.316	48.35	Pk	32	-23.1	.3	-40	17.55	28	-10.45	0-360	100	H
3	2.7355	41.53	Pk	32.5	-22.3	.4	-40	12.13	28	-15.87	0-360	100	H
4	3.64663	61.19	Pk	33	-33.2	.2	-40	21.19	28	-6.81	0-360	100	H
5	4.55838	45.92	Pk	33.9	-31	.4	-40	9.22	28	-18.78	0-360	100	H
6	5.47013	51.1	Pk	34.6	-30	.3	-40	16	28	-12	0-360	100	H
7	6.38188	50.11	Pk	35.4	-28.3	.6	-40	17.81	28	-10.19	0-360	100	H
8	7.29363	51.77	Pk	35.7	-27.5	.3	-40	20.27	28	-7.73	0-360	100	H
9	8.20538	46.25	Pk	35.8	-26.4	.5	-40	16.15	28	-11.85	0-360	100	H
10	9.11713	40.98	Pk	36.3	-24.7	.4	-40	12.98	28	-15.02	0-360	100	H
11	1.8235	46.87	Pk	30.2	-23.8	.4	-40	13.67	28	-14.33	0-360	200	V
12	2.7355	39.9	Pk	32.5	-22.3	.4	-40	10.5	28	-17.5	0-360	200	V
13	3.64663	58.9	Pk	33	-33.2	.2	-40	18.9	28	-9.1	0-360	200	V
14	4.55838	45.64	Pk	33.9	-31	.4	-40	8.94	28	-19.06	0-360	200	V
15	5.47013	51.2	Pk	34.6	-30	.3	-40	16.1	28	-11.9	0-360	200	V
16	6.38177	53.92	Av	35.4	-28.3	.6	-40	21.62	28	-6.38	360	128	V
17	7.29363	51.85	Pk	35.7	-27.5	.3	-40	20.35	28	-7.65	0-360	200	V
18	8.20538	46.35	Pk	35.8	-26.4	.5	-40	16.25	28	-11.75	0-360	200	V
19	9.11669	40.39	Pk	36.3	-24.7	.4	-40	12.39	28	-15.61	0-360	200	V
20*	2.402	66.32	Pk	31.9	-22.9	.4	-40	35.72	-	-	0-360	100	H
21*	2.48	69.29	Pk	32.3	-22.8	.3	-40	39.09	-	-	0-360	100	H
22*	2.402	70.82	Pk	31.9	-22.9	.4	-40	40.22	-	-	0-360	200	V
23*	2.4265	79	Pk	32.2	-22.9	.4	-40	48.7	-	-	0-360	200	V
24*	2.48	87.6	Pk	32.3	-22.8	.3	-40	57.4	-	-	0-360	200	V

Pk - Peak detector
 Av - Average detection
 *- BLE

8.2.2. Mid Channel



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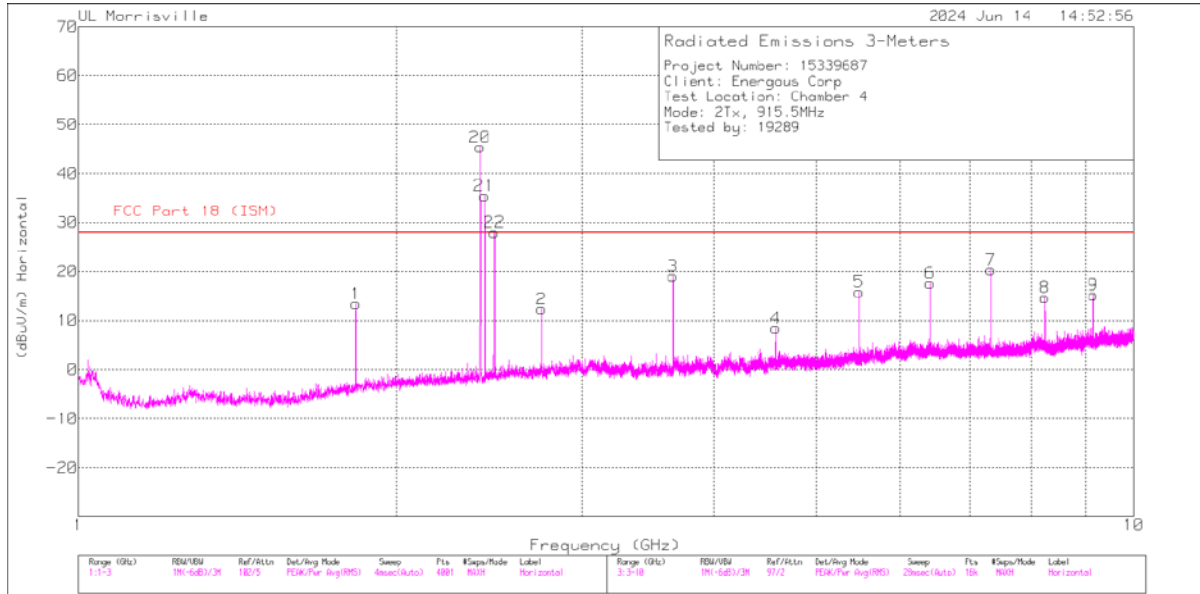


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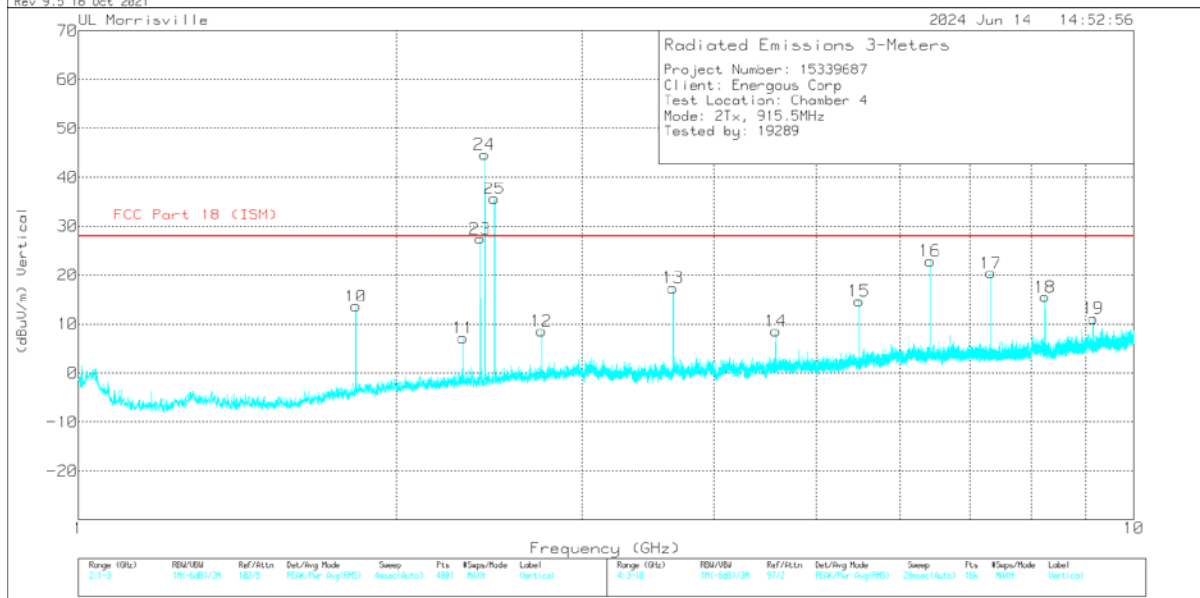
Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Filter (dB)	DCF (dB)	Corrected Reading (dBuV/m)	FCC Part 18 (ISM)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.827	47.64	Pk	30.2	-23.8	.4	-40	14.44	28	-13.56	0-360	100	H
2	2.354	36.35	Pk	31.8	-23	.3	-40	5.45	28	-22.55	0-360	100	H
3	2.741	41.88	Pk	32.5	-22.3	.4	-40	12.48	28	-15.52	0-360	100	H
4	3.65406	60.73	Pk	33	-33.2	.3	-40	20.83	28	-7.17	0-360	100	H
5	4.56756	45.96	Pk	34	-31.1	.3	-40	9.16	28	-18.84	0-360	100	H
6	5.48106	51.33	Pk	34.6	-30.1	.3	-40	16.13	28	-11.87	0-360	100	H
7	6.39456	50.28	Pk	35.4	-28.2	.5	-40	17.98	28	-10.02	0-360	100	H
8	7.30806	50.86	Pk	35.7	-27.4	.3	-40	19.46	28	-8.54	0-360	100	H
9	8.22156	46	Pk	35.8	-26.3	.4	-40	15.9	28	-12.1	0-360	100	H
10	9.13528	41.18	Pk	36.3	-24.8	.5	-40	13.18	28	-14.82	0-360	100	H
11	1.827	47.76	Pk	30.2	-23.8	.4	-40	14.56	28	-13.44	0-360	200	V
12	2.2915	45.84	Pk	32	-22.8	.4	-40	15.44	28	-12.56	0-360	200	V
13	2.7405	39.92	Pk	32.5	-22.3	.4	-40	10.52	28	-17.48	0-360	200	V
14	3.65406	58.42	Pk	33	-33.2	.3	-40	18.52	28	-9.48	0-360	200	V
15	4.56756	45.45	Pk	34	-31.1	.3	-40	8.65	28	-19.35	0-360	200	V
16	5.48106	50.18	Pk	34.6	-30.1	.3	-40	14.98	28	-13.02	0-360	200	V
17	6.39452	56.29	Av	35.4	-28.2	.5	-40	23.99	28	-4.01	24	103	V
18	7.30806	51.05	Pk	35.7	-27.4	.3	-40	19.65	28	-8.35	0-360	200	V
19	8.22156	47.82	Pk	35.8	-26.3	.4	-40	17.72	28	-10.28	0-360	200	V
20	9.1355	40.89	Pk	36.3	-24.8	.5	-40	12.89	28	-15.11	0-360	200	V
21*	2.402	63.24	Pk	31.9	-22.9	.4	-40	32.64	-	-	0-360	100	H
22*	2.4265	92.61	Pk	32.2	-22.9	.4	-40	62.31	-	-	0-360	100	H
23*	2.4805	68.84	Pk	32.3	-22.8	.3	-40	38.64	-	-	0-360	100	H
24*	2.402	92.3	Pk	31.9	-22.9	.4	-40	61.7	-	-	0-360	200	V
25*	2.426	64.76	Pk	32.2	-22.9	.4	-40	34.46	-	-	0-360	200	V
26*	2.4805	81.85	Pk	32.3	-22.8	.3	-40	51.65	-	-	0-360	200	V

Pk - Peak detector
 Av - Average detection
 *- BLE

8.2.3. High Channel



Rev 9.5 18 Oct 2021



Rev 9.5 18 Oct 2021

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	89509 ACF (dB/m)	Gain/Loss (dB)	Filter (dB)	DCF (dB)	Corrected Reading (dBuV/m)	FCC Part 18 (ISM)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	1.831	46.53	Pk	30.3	-23.8	.4	-40	13.43	28	-14.57	0-360	100	H
2	2.747	41.86	Pk	32.5	-22.4	.4	-40	12.36	28	-15.64	0-360	100	H
3	3.66194	58.84	Pk	33	-33.1	.3	-40	19.04	28	-8.96	0-360	100	H
4	4.57763	45.65	Pk	34	-31.4	.2	-40	8.45	28	-19.55	0-360	100	H
5	5.49288	51.1	Pk	34.6	-30.2	.4	-40	15.9	28	-12.1	0-360	100	H
6	6.40856	49.55	Pk	35.4	-27.9	.6	-40	17.65	28	-10.35	0-360	100	H
7	7.32425	52.2	Pk	35.6	-27.7	.3	-40	20.4	28	-7.6	0-360	100	H
8	8.23972	45.1	Pk	35.8	-26.6	.4	-40	14.7	28	-13.3	0-360	100	H
9	9.15519	43.36	Pk	36.3	-25	.6	-40	15.26	28	-12.74	0-360	100	H
10	1.831	46.74	Pk	30.3	-23.8	.4	-40	13.64	28	-14.36	0-360	200	V
11	2.314	37.95	Pk	32	-23.1	.3	-40	7.15	28	-20.85	0-360	200	V
12	2.747	38.12	Pk	32.5	-22.4	.4	-40	8.62	28	-19.38	0-360	200	V
13	3.66194	57.17	Pk	33	-33.1	.3	-40	17.37	28	-10.63	0-360	200	V
14	4.57763	45.75	Pk	34	-31.4	.2	-40	8.55	28	-19.45	0-360	200	V
15	5.49288	49.91	Pk	34.6	-30.2	.4	-40	14.71	28	-13.29	0-360	200	V
16	6.40856	53.66	Av	35.4	-27.9	.6	-40	21.76	28	-6.24	50	180	V
17	7.32425	52.22	Pk	35.6	-27.7	.3	-40	20.42	28	-7.58	0-360	200	V
18	8.23994	45.95	Pk	35.8	-26.6	.4	-40	15.55	28	-12.45	0-360	200	V
19	9.15519	39.26	Pk	36.3	-25	.6	-40	11.16	28	-16.84	0-360	200	V
20*	2.402	75.98	Pk	31.9	-22.9	.4	-40	45.38	-	-	0-360	100	H
21*	2.42625	65.75	Pk	32.2	-22.9	.4	-40	35.45	-	-	0-360	100	H
22*	2.48	58.18	Pk	32.3	-22.8	.3	-40	27.98	-	-	0-360	100	H
23*	2.4025	58.05	Pk	31.9	-22.9	.4	-40	27.45	-	-	0-360	200	V
24	2.426	74.96	Pk	32.2	-22.9	.4	-40	44.66	-	-	0-360	200	V
25	2.48	65.85	Pk	32.3	-22.8	.3	-40	35.65	-	-	0-360	200	V

Pk - Peak detector
 Av - Average detection
 *- BLE

8.3. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

FCC / OST MP-5

LIMIT

§ FCC 18.307 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

§ FCC 18.307 (b) All other Part 18 consumer devices:

Frequency range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

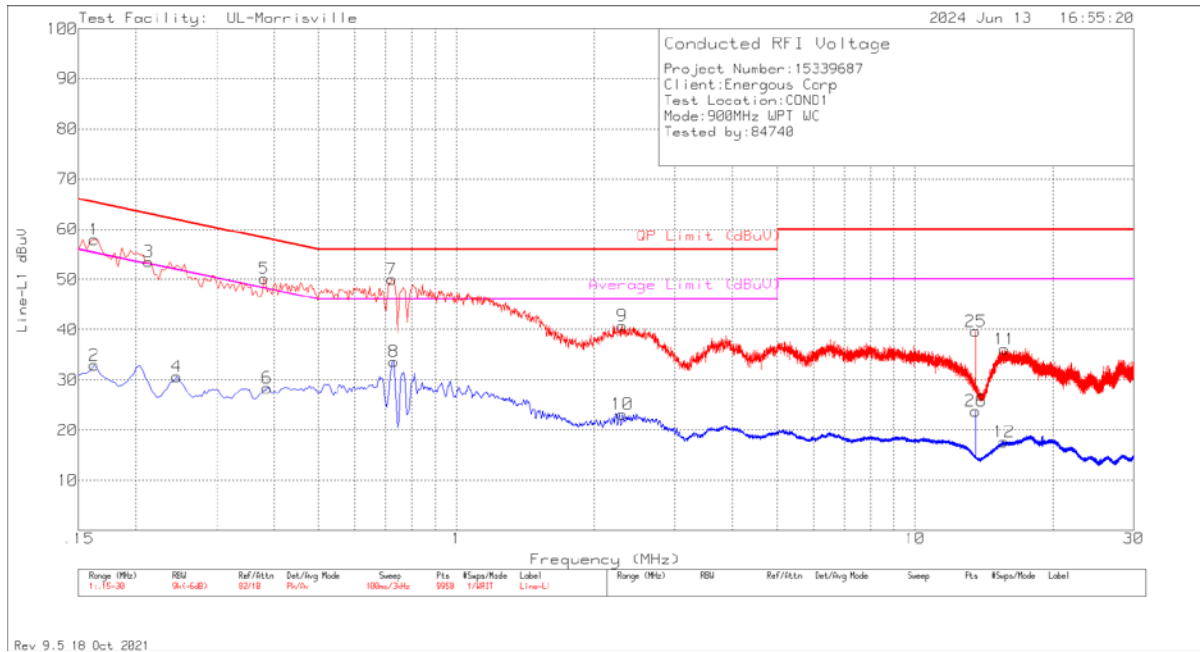
Notes:
1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

RESULTS

No non-compliance noted:

8.3.1. USB

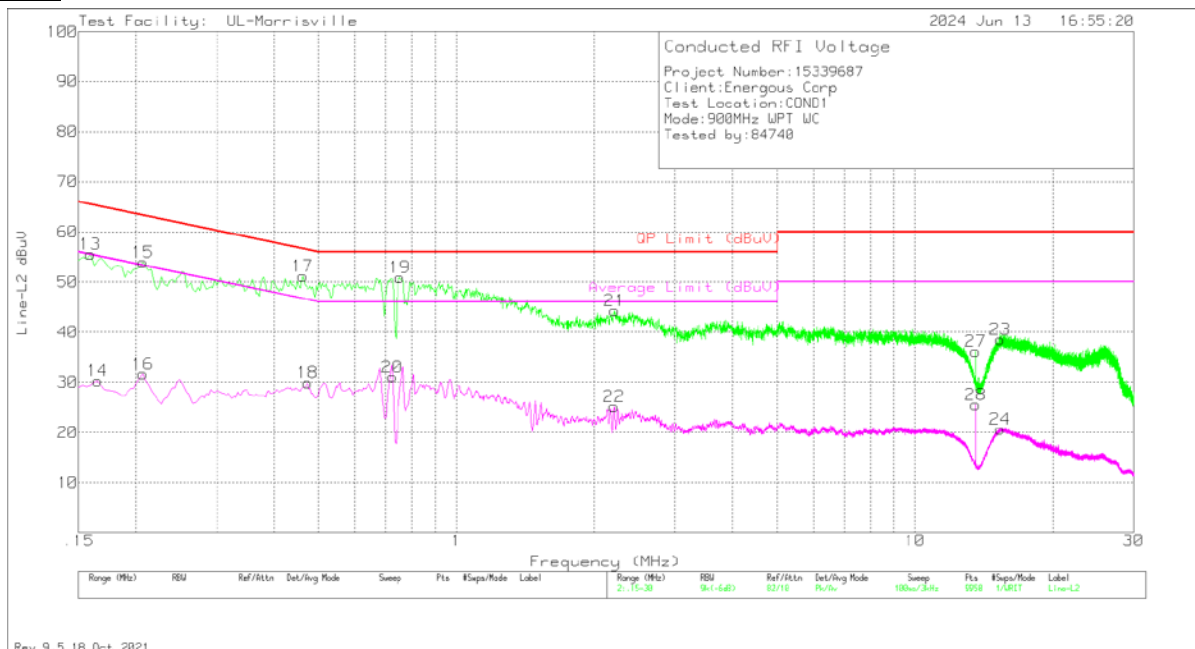
Line 1



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.162	47.87	Pk	.3	9.8	57.97	65.36	-7.39	-	-
2	.162	22.78	Av	.3	9.8	32.88	-	-	55.36	-22.48
3	.213	43.58	Pk	.2	9.8	53.58	63.09	-9.51	-	-
4	.246	20.62	Av	.2	9.8	30.62	-	-	51.89	-21.27
5	.381	40.26	Pk	.1	9.8	50.16	58.26	-8.1	-	-
6	.387	18.5	Av	.1	9.8	28.4	-	-	48.13	-19.73
7	.71	36.97	Qp	.1	9.8	46.87	56	-9.13	-	-
8	.729	23.73	Av	.1	9.8	33.63	-	-	46	-12.37
9	2.301	30.86	Pk	.1	9.8	40.76	56	-15.24	-	-
10	2.304	13.2	Av	.1	9.8	23.1	-	-	46	-22.9
11	15.675	25.81	Pk	.2	10.1	36.11	60	-23.89	-	-
12	15.657	7.39	Av	.2	10.1	17.69	-	-	50	-32.31
25*	13.56	29.47	Pk	.2	10	39.67	60	-20.33	-	-
26*	13.56	13.59	Av	.2	10	23.79	-	-	50	-26.21

Pk - Peak detector
 Av - Average detection
 Qp - Quasi-Peak detector
 *-RFID from badge reader.

Line 2

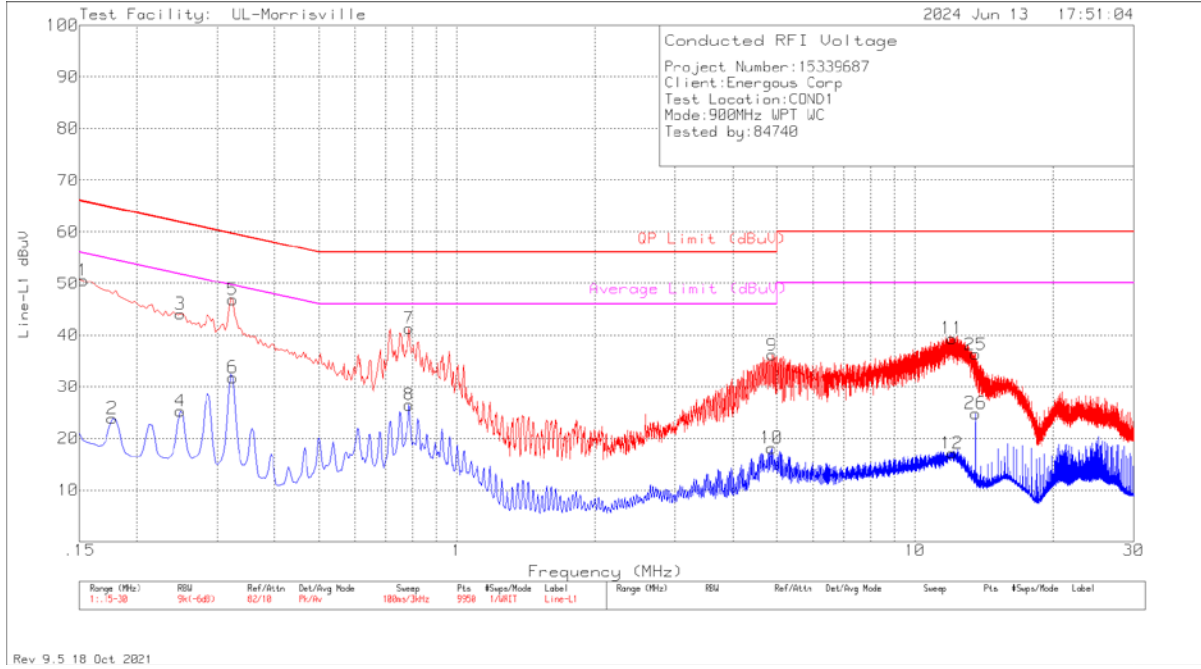


Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
13	.159	45.48	Pk	.3	9.8	55.58	65.52	-9.94	-	-
14	.165	20.21	Av	.3	9.8	30.31	-	-	55.21	-24.9
15	.207	43.98	Pk	.2	9.8	53.98	63.32	-9.34	-	-
16	.207	21.65	Av	.2	9.8	31.65	-	-	53.32	-21.67
17	.46438	35.08	Qp	.1	9.8	44.98	56.61	-11.63	-	-
18	.474	19.97	Av	.1	9.8	29.87	-	-	46.44	-16.57
19	.75257	38.09	Qp	.1	9.8	47.99	56	-8.01	-	-
20	.726	21.19	Av	.1	9.8	31.09	-	-	46	-14.91
21	2.214	34.45	Pk	.1	9.8	44.35	56	-11.65	-	-
22	2.211	15.23	Av	.1	9.8	25.13	-	-	46	-20.87
23	15.354	28.29	Pk	.2	10.1	38.59	60	-21.41	-	-
24	15.351	10.33	Av	.2	10.1	20.63	-	-	50	-29.37
27*	13.56	26	Pk	.2	10	36.2	60	-23.8	-	-
28*	13.56	15.36	Av	.2	10	25.56	-	-	50	-24.44

Pk - Peak detector
 Av - Average detection
 Qp - Quasi-Peak detector
 *-RFID from badge reader.

8.3.2. PoE

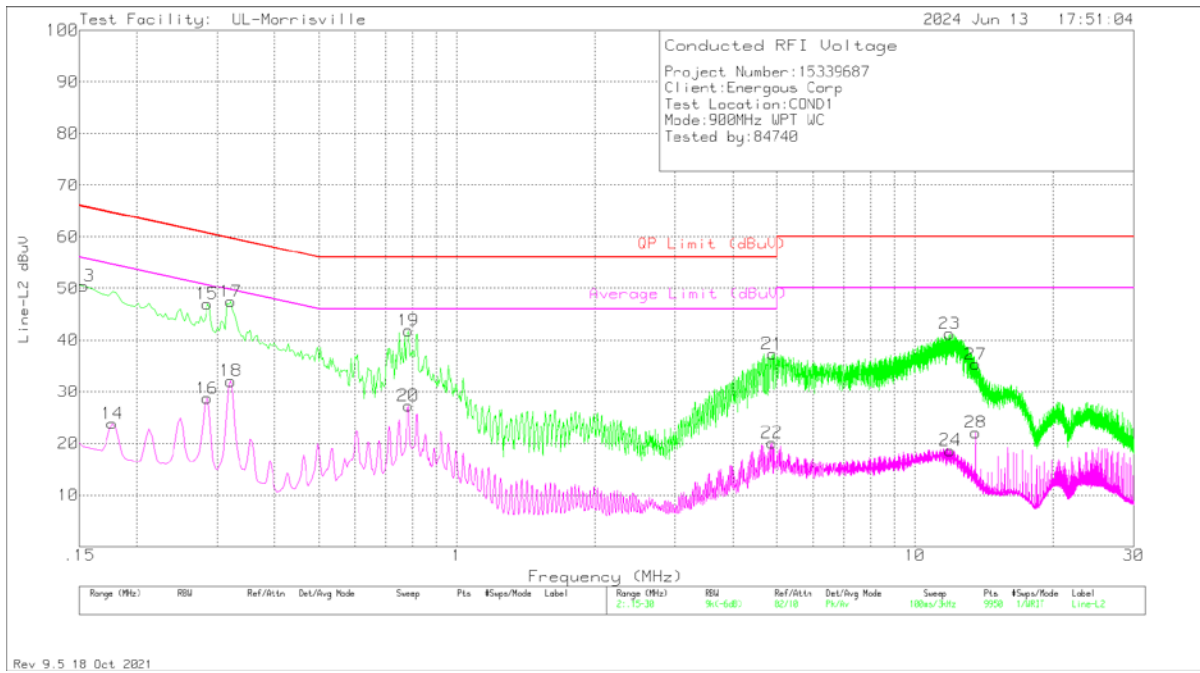
Line 1



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.153	40.5	Pk	.3	9.8	50.6	65.84	-15.24	-	-
2	.177	13.77	Av	.3	9.8	23.87	-	-	54.63	-30.76
3	.249	34.1	Pk	.2	9.8	44.1	61.79	-17.69	-	-
4	.249	15.29	Av	.2	9.8	25.29	-	-	51.79	-26.5
5	.324	36.95	Pk	.1	9.8	46.85	59.6	-12.75	-	-
6	.324	21.91	Av	.1	9.8	31.81	-	-	49.6	-17.79
7	.786	31.38	Pk	.1	9.8	41.28	56	-14.72	-	-
8	.786	16.6	Av	.1	9.8	26.5	-	-	46	-19.5
9	4.869	26.15	Pk	.1	9.9	36.15	56	-19.85	-	-
10	4.8645	8.17	Av	.1	9.9	18.17	-	-	46	-27.83
11	12.054	29.27	Pk	.1	10	39.37	60	-20.63	-	-
12	12.039	7.05	Av	.1	10	17.15	-	-	50	-32.85
25*	13.56	26.06	Pk	.2	10	36.26	60	-23.74	-	-
26*	13.56	14.68	Av	.2	10	24.88	-	-	50	-25.12

Pk - Peak detector
 Av - Average detection
 *-RFID from badge reader.

Line 2

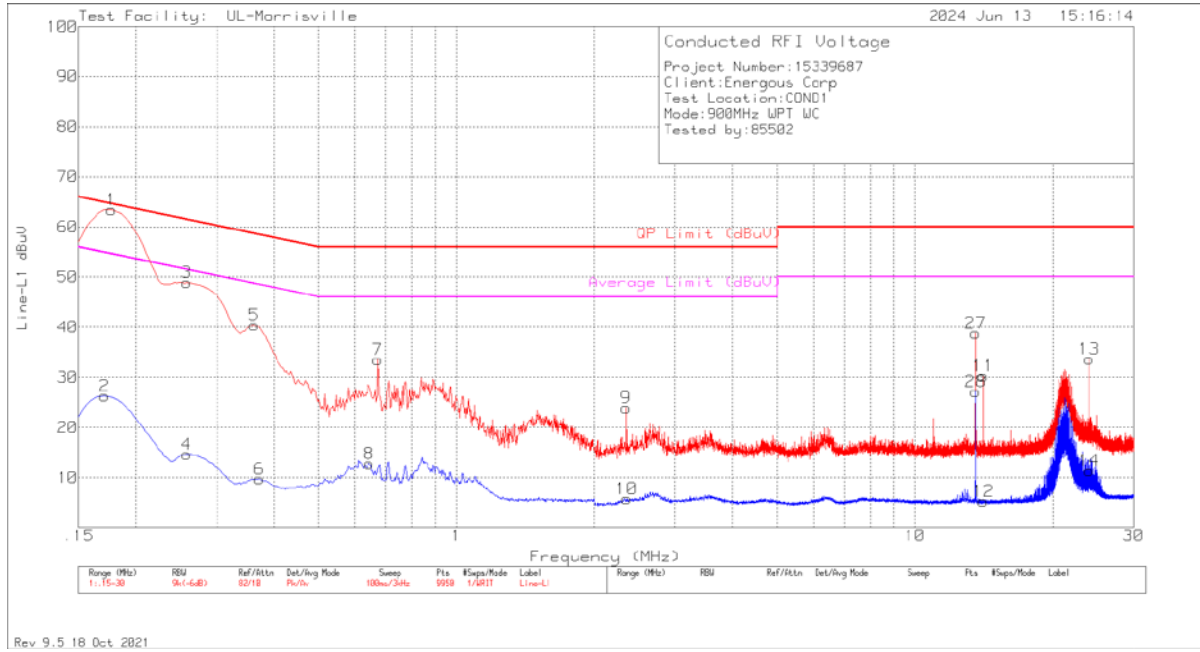


Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
13	.153	40.39	Pk	.3	9.8	50.49	65.84	-15.35	-	-
14	.177	13.75	Av	.3	9.8	23.85	-	-	54.63	-30.78
15	.285	36.97	Pk	.2	9.8	46.97	60.67	-13.7	-	-
16	.285	18.72	Av	.2	9.8	28.72	-	-	50.67	-21.95
17	.321	37.57	Pk	.1	9.8	47.47	59.68	-12.21	-	-
18	.321	22.19	Av	.1	9.8	32.09	-	-	49.68	-17.59
19	.783	31.93	Pk	.1	9.8	41.83	56	-14.17	-	-
20	.783	17.39	Av	.1	9.8	27.29	-	-	46	-18.71
21	4.881	27.34	Pk	.1	9.9	37.34	56	-18.66	-	-
22	4.872	10.12	Av	.1	9.9	20.12	-	-	46	-25.88
23	11.901	31.12	Pk	.1	10	41.22	60	-18.78	-	-
24	11.943	8.54	Av	.1	10	18.64	-	-	50	-31.36
27*	13.56	25.09	Pk	.2	10	35.29	60	-24.71	-	-
28*	13.56	11.88	Av	.2	10	22.08	-	-	50	-27.92

Pk - Peak detector
 Av - Average detection
 *-RFID from badge reader.

8.3.3. DC Power Supply

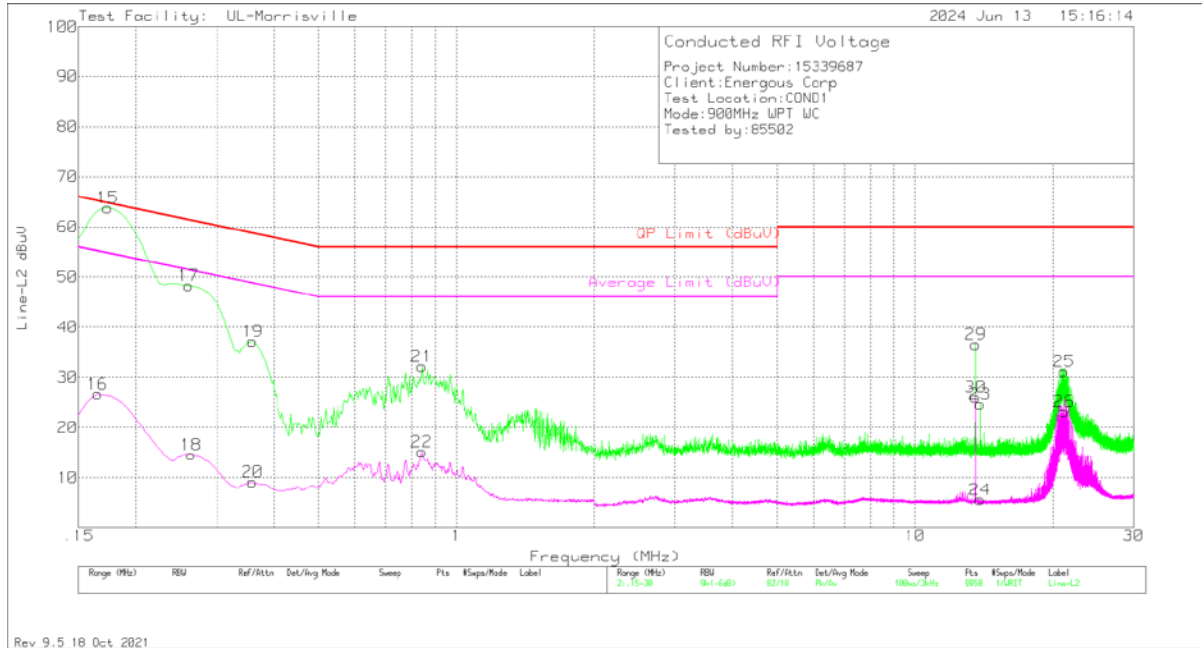
Line 1



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.17279	46.76	Qp	.3	9.8	56.86	64.83	-7.97	-	-
2	.171	16.17	Av	.3	9.8	26.27	-	-	54.91	-28.64
3	.258	38.92	Pk	.2	9.8	48.92	61.5	-12.58	-	-
4	.258	4.67	Av	.2	9.8	14.67	-	-	51.5	-36.83
5	.363	30.55	Pk	.1	9.8	40.45	58.66	-18.21	-	-
6	.372	-.2	Av	.1	9.8	9.7	-	-	48.46	-38.76
7	.675	23.59	Pk	.1	9.8	33.49	56	-22.51	-	-
8	.645	2.85	Av	.1	9.8	12.75	-	-	46	-33.25
9	2.346	13.99	Pk	.1	9.8	23.89	56	-32.11	-	-
10	2.355	-4.19	Av	.1	9.8	5.71	-	-	46	-40.29
11	14.094	20.13	Pk	.2	10	30.33	60	-29.67	-	-
12	14.115	-4.91	Av	.2	10	5.29	-	-	50	-44.71
13	24.003	23.13	Pk	.3	10.2	33.63	60	-26.37	-	-
14	24	.9	Av	.3	10.2	11.4	-	-	50	-38.6
27*	13.563	28.55	Pk	.2	10	38.75	60	-21.25	-	-
28*	13.563	17	Av	.2	10	27.2	-	-	50	-22.8

Pk - Peak detector
 Av - Average detection
 Qp - Quasi-Peak detector
 *-RFID from badge reader.

Line 2



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VDF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
15	.1713	46.66	Qp	.3	9.8	56.76	64.9	-8.14	-	-
16	.165	16.57	Av	.3	9.8	26.67	-	-	55.21	-28.54
17	.261	38.31	Pk	.2	9.8	48.31	61.4	-13.09	-	-
18	.264	4.57	Av	.2	9.8	14.57	-	-	51.3	-36.73
19	.36	27.26	Pk	.1	9.8	37.16	58.73	-21.57	-	-
20	.36	-.81	Av	.1	9.8	9.09	-	-	48.73	-39.64
21	.84	22.3	Pk	.1	9.8	32.2	56	-23.8	-	-
22	.84	5.28	Av	.1	9.8	15.18	-	-	46	-30.82
23	13.893	14.48	Pk	.2	10	24.68	60	-35.32	-	-
24	13.893	-4.63	Av	.2	10	5.57	-	-	50	-44.43
25	21.153	20.79	Pk	.2	10.2	31.19	60	-28.81	-	-
26	21.153	12.8	Av	.2	10.2	23.2	-	-	50	-26.8
29*	13.56	26.36	Pk	.2	10	36.56	60	-23.44	-	-
30*	13.56	15.86	Av	.2	10	26.06	-	-	50	-23.94

Pk - Peak detector
 Av - Average detection
 Qp - Quasi-Peak detector
 *-RFID from badge reader.

9. SETUP PHOTOS

Please refer to R15339687-EP2 for setup photos

END OF TEST REPORT