July 24, 2023

Trackonomy Systems
214 Devcon Drive
San Jose, CA 95112

Dear Saurabh Sanghai,

Enclosed is the Wireless test report compliance testing of the Trackonomy Systems, Gateway Terminal as tested to the requirements of Title 47 of the CFR, for Intentional Radiators.

Thank you for using the services of Eurofins Electrical and Electronic Testing NA, Inc. If you have any questions regarding these results or if Eurofins Electrical and Electronic Testing NA, Inc. can be of further service to you, please feel free to contact me.

Garry Chou

Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIR127968-Track_FCC-LORA

ilac-MRA A2LA ACCREDITED CERT #591.02

Eurofins Electrical and Electronic Testing NA, Inc. is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

FCC Test Report

Applicant name: Trackonomy Systems

Product: Gateway Terminal

Report: WIR127968-Track_FCC-LORA

Applicant Address:

214 Devcon Drive
San Jose, CA 95112

Manufacturer Address:

214 Devcon Drive
San Jose, CA 95112

Prepared By:
Eurofins Electrical and Electronic Testing NA, Inc.
3162 Belick St.
Santa Clara CA, 95054

FCC Test Report

Applicant name: Trackonomy Systems

Product: Gateway Terminal

Standard
47 CFR FCC Part 15, Subpart C (Section 15.247)
558074 D01 15.247 Meas Guidance v05r02
ANSI C63.10: 2013

Christopher Martin
Christopher Martin
Test Engineer, Wireless Laboratory

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements FCC Rules under normal use and maintenance.

Gary Chou
Gary Chou
Wireless Engineering Manager, Wireless Laboratory

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	July 24, 2023	Initial Issue.
∅	August 17, 2023	Update channel information

Table of Contents

I. Executive Summary

A. Executive Summary

47 CFR FCC Part 15, Subpart C (SECTION 15.247)				
FCC/ IC Cluse	ISED	Test Item	Result	Remarks
15.207	RSS Gen 8.8	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.205 &15.209 & 15.247(d)	RSS Gen 8.8	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	RSS 247 5.5C	6dB bandwidth & 99% bandwidth	PASS	Note
15.247(b)	RSS 247 5.2.1 RSS Gen 6.7	Conducted power	PASS	Note
15.247(e)	RSS 247 5.4.4	Power Spectral Density	PASS	Note.
15.203	RSS 247 5.2.2	Antenna Requirement	PASS	Dipole Antenna (antennas are permanently bonded to the enclosure) meet the requirement.

Note:

1. Please refer to FCC Module Report: 2ASE0RFM95C
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

II. Equipment Information

A. Overview

EUT Summary Table

Product:	Gateway Terminal	
Brand:	Trackonomy Systems	
Model(s) Tested:	GBP-2002	
Series Model:	N/A	
Sample Status:	Original	
EUT Specifications:	Primary Power:	Input Power: Voltage: 120 Vac/ 60mHz
	Voltage Frequency:	N/A
	Technology / Type of Modulations:	CSS
	Operating Frequency :	915 ~ 915 MHz
	FCC ID:	2AXA8-GBP-2002
	Antenna Brand/ Model	TAOGLAS/ TG.55.8113
	Antenna Type: Dipole Antenna	Antenna Gain: 2.56 dBi
	Antenna connector:	SMA(antennas are permanently bonded to the enclosure)
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 20.3° C	
	Relative Humidity: 47.5%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Christopher Martin	
Issue Date(s):	July 24, 2023	

NOTE: The following modules can be chosen to be configured in the EUT.

	Model No.	FCC ID	Note
-	-	-	-
-	-	-	-

FCC/IC RF Testing Units Setting

Model	Hardware (FW) Rev.	Firmware (FW) Rev.	FW operation verification and Instruction
GBP-2002	Nominal HW V2	Nominal FW V2	Verify by Spectrum Analyzer & Laptop

B. Description of Operator Modes

Power Setting:

Default.

C. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
-	-	-	-	-	-	-

Note: (Describe the outline of a simulator, if used for the tests, as a note under the table.)

Insert Cable Connections to/from EUT provided by test team.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
	-	-	-	-	0	-

Note: The core(s) is(are) originally attached to the cable(s).

General Description of Applied Standards

D. References

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

- **47 CFR FCC Part 15, Subpart C (Section 15.247)**
- **558074 D01 15.247 Meas Guidance v05r02**
- **RSS 247 Issue2**
- **RSS Gen Issue5**
- **ANSI C63.10:2013**

E. Test Site

All testing was performed at Eurofins Electrical and Electronic Testing NA, Inc., 3162 Belick St. Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Eurofins Electrical and Electronic Testing NA, Inc. has been accredited by the American Association for Laboratory Accreditation (A2LA) (Certificate #: 0591.02) in accordance with ISO/IEC 17025:2017.

Eurofins Electrical and Electronic Testing NA, Inc. is part of the Eurofins Electrical & Electronics (E&E) global compliance network.

F. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%

Uncertainty Calculations Summary

G. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

H. Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electromagnetic Compatibility Lab for testing was returned to Trackonomy Systems upon completion of testing.

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Radiated Emission and Bandage Measurement

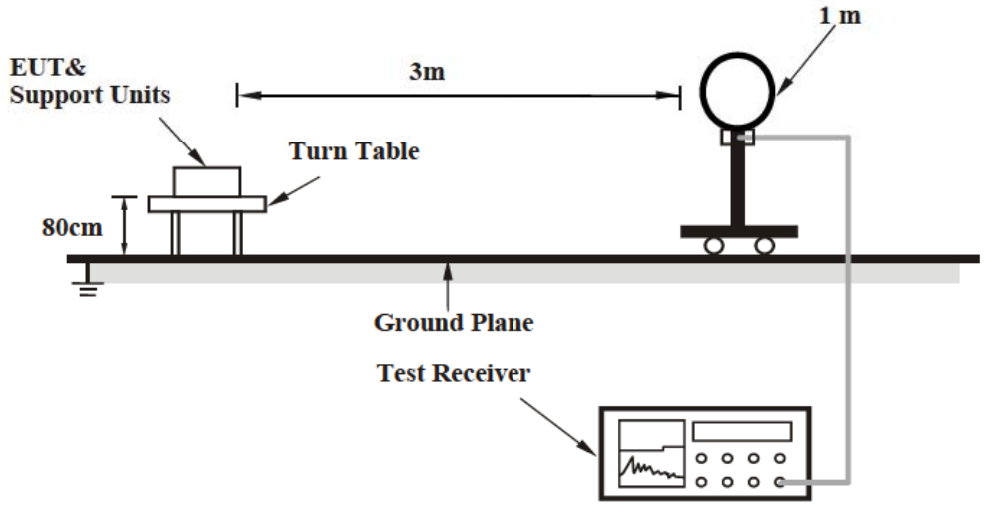
Limits of Radiated Emission and Bandage Measurement:
Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (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

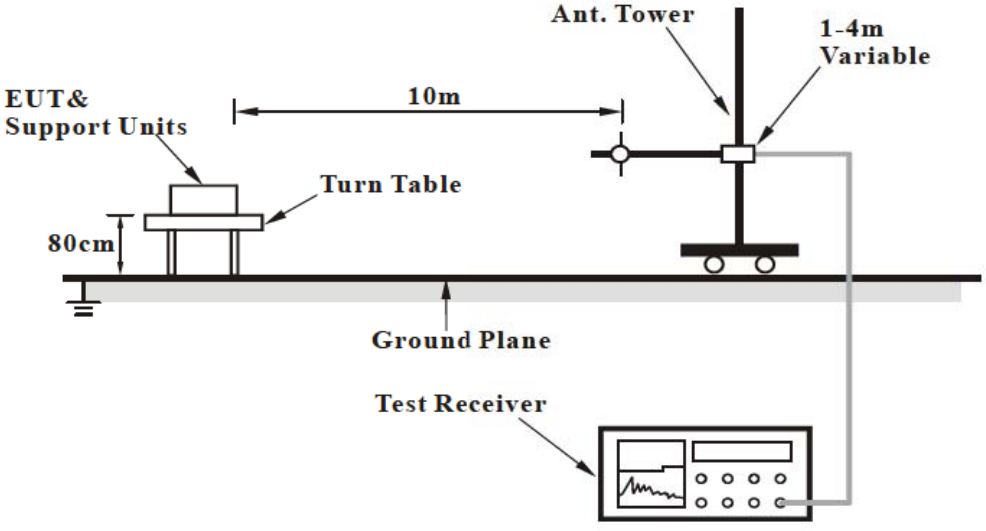
Test Procedures: The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured above 18 GHz.

Test Setup

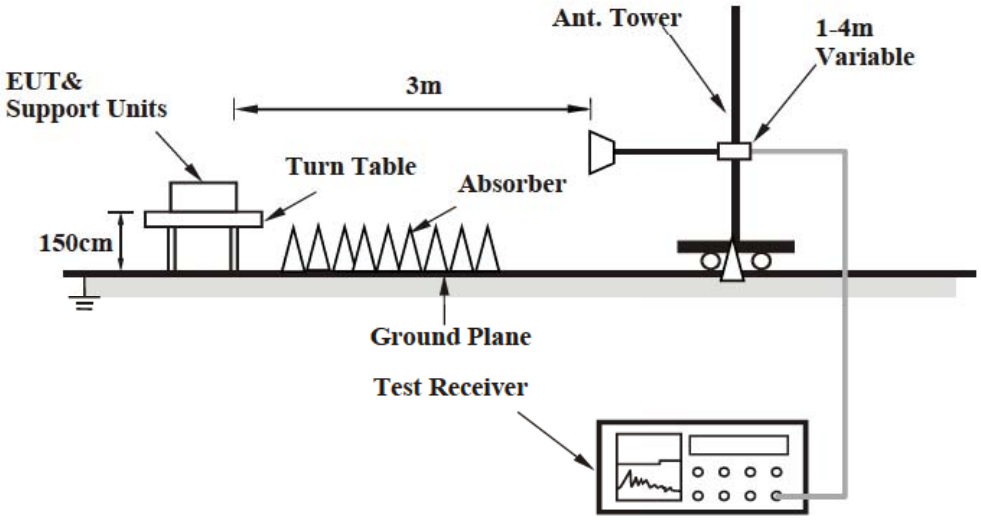
For Radiated Emission Below 30MHz



For Radiated emission 30 MHz to 1GHz



For Radiated emission 1GHz to 40GHz



Test Results: The EUT was tested is **compliant** with Radiated Spurious Emissions Requirements.

Test Equipment List

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2017.

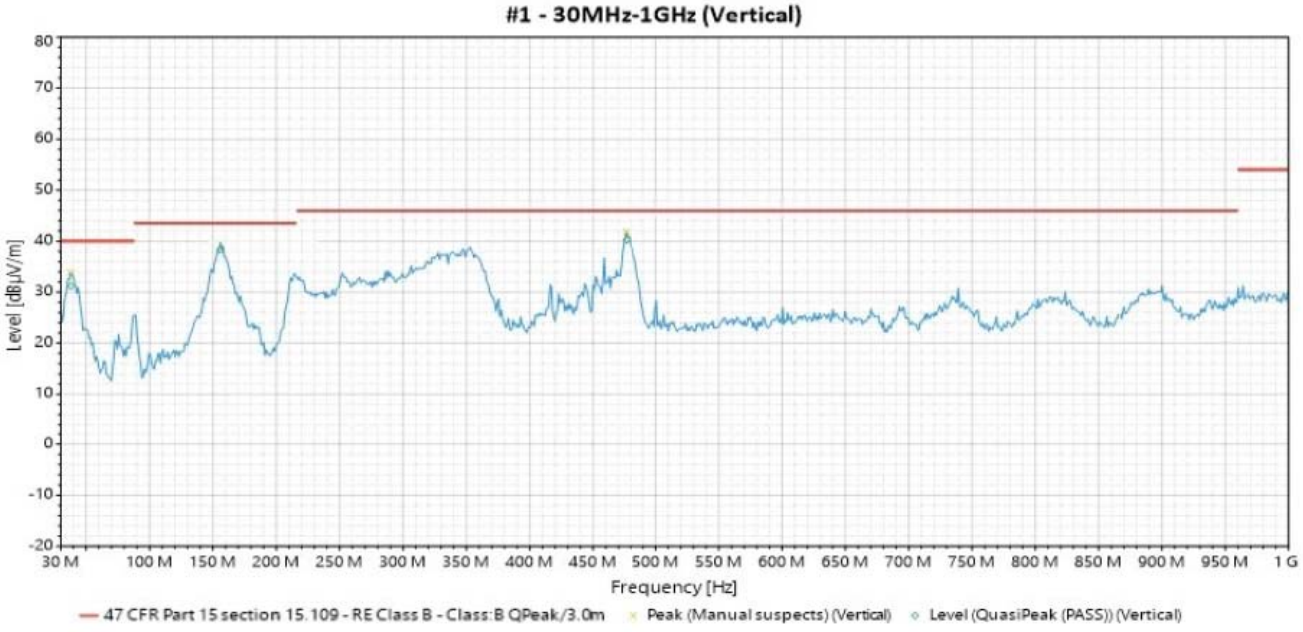
Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1S2003	EMI Test Receiver	Keysight	N9030B	11/01/2022	11/01/2023
1S2399	Turntable Controller	SUNOL SCIENCE	SC99V	Not Required	Not Required
1S2486	5 Meter Chamber Control Room	Panashield	5 Meter Control Room	Not Required	Not Required
1S3826	Horn Antenna	ETS-LINDGREN	3117	04/06/2023	04/06/2025
1S4802	Preamplifier	EMC Instrument	EMC118A45SE	Note 1	Note 1
1S2668	Preamplifier	Sonoma Instrument	310N	Note 1	Note 1
1S2600	Antenna	Sunol Sciences Corp	JB3	04/ 11/ 2023	04/ 11/ 2025
1S3983	Loop Antenna	ETS-LINDGREN	6512	10/ 14 /2021	10/ 14 /2023
Note 1: Verified by calibrated instrumentation at the time of testing					

Test Engineer: Christopher Martin

Test Date(s): 04/22/2023

Test Data
Radiated Emissions (30 MHz~1000 MHz)

EUT Test Condition		Measurement Detail	
Input Power	120 Vac, 60Hz	Frequency Range	30MHz-1GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 915 MHz		

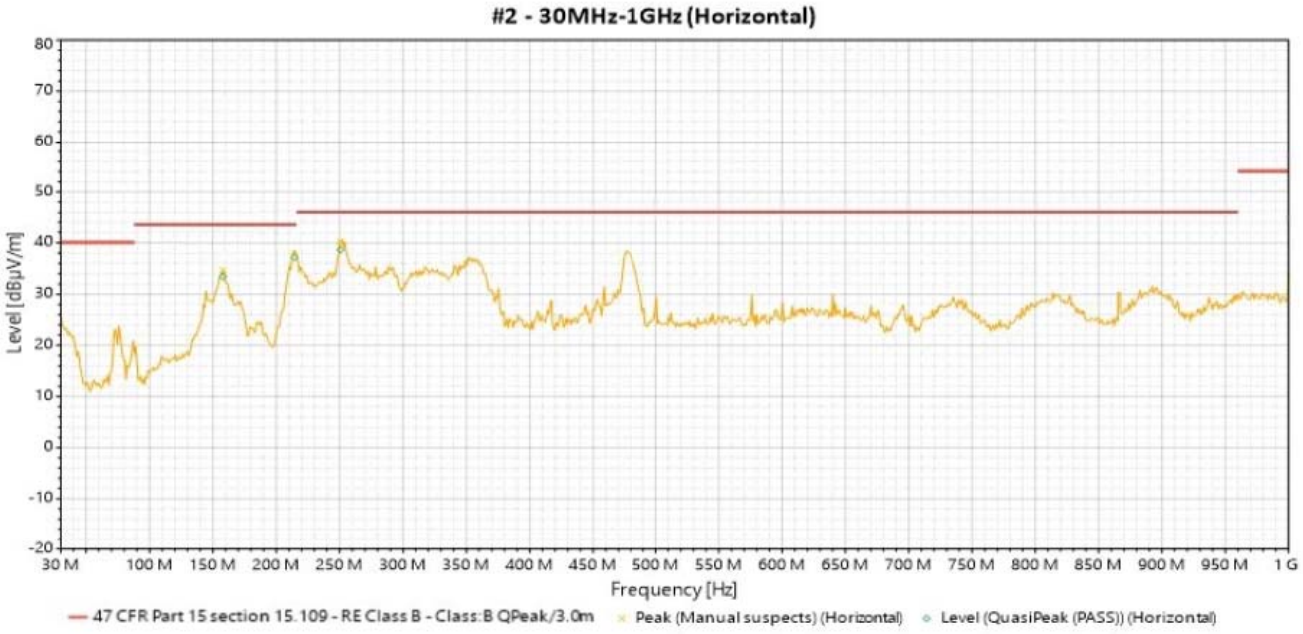


Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Pass/ Fail
1	37.92	Vertical	31.196	40	-8.804	1.14	339	-8.33	Pass
2	155.78	Vertical	38.326	43.5	-5.174	1.08	358	-8.45	Pass
3	476.61	Vertical	40.254	46	-5.746	1.56	81	-2.67	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

EUT Test Condition		Measurement Detail	
Input Power	120 Vac, 60Hz	Frequency Range	30MHz-1GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 915MHz		



Antenna Polarity & Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Pass/ Fail
1	157.94	Horizontal	33.452	43.5	-10.048	1.38	313	-9	Pass
2	214.4	Horizontal	37.202	46	-8.798	3.33	84	-9.67	Pass
3	250.59	Horizontal	38.701	46	-7.299	2.37	254	-8.42	Pass

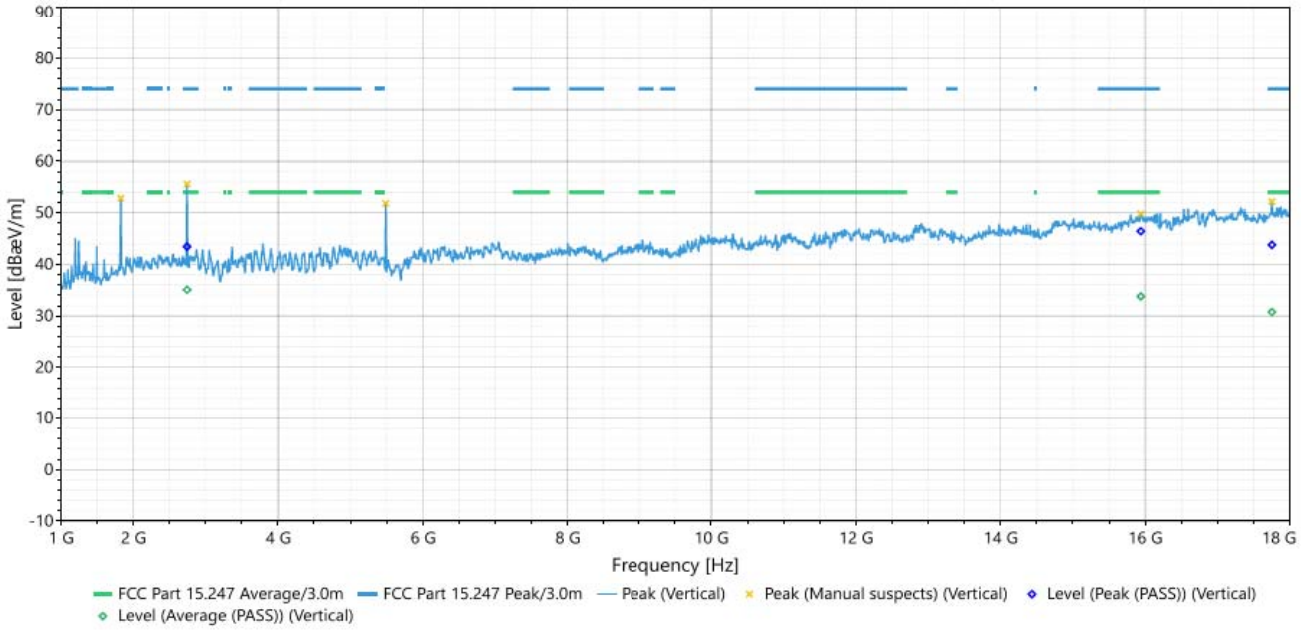
REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

Radiated Emissions (Above 1GHz)

EUT Test Condition		Measurement Detail	
Input Power	120 Vac, 60Hz	Frequency Range	1GHz-26.5GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 915 MHz		

#1 - 1GHz-18GHz (Vertical)



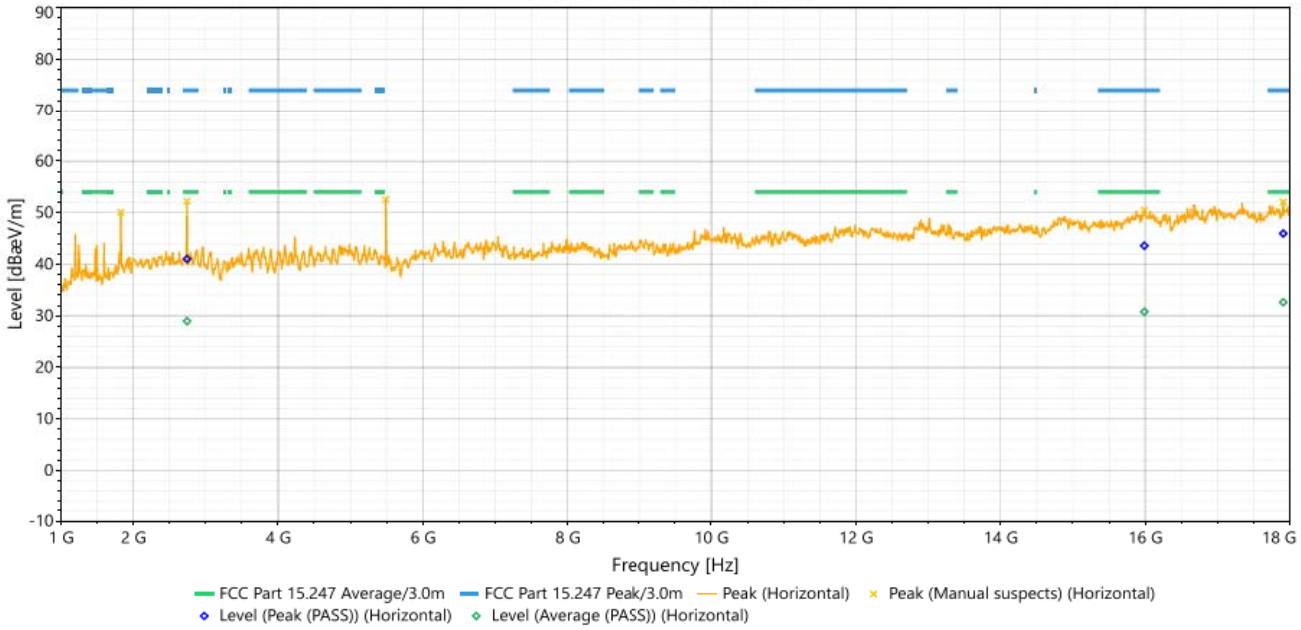
Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	2744.1	Vertical	43.423	74	-30.577	1	245	2.21	Peak (PASS)
2	2744.1	Vertical	35.071	54	-18.929	1	245	2.21	Average (PASS)
3	15939.5	Vertical	46.431	74	-27.569	1	283	8.5	Peak (PASS)
4	15939.5	Vertical	33.78	54	-20.22	1	283	8.5	Average (PASS)
5	17751.7	Vertical	43.769	74	-30.231	1.07	213	6.95	Peak (PASS)
6	17751.7	Vertical	30.727	54	-23.273	1.07	213	6.95	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

EUT Test Condition		Measurement Detail	
Input Power	120 Vac	Frequency Range	1GHz-26.5GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Christopher Martin
Test Mode	TX MODE 915 MHz		

#2 - 1GHz-18GHz (Horizontal)



Antenna Polarity & Test Distance: Horizontal at 3m									
No.	Frequency (MHz)	Polarization	Level Peak[dB(uV/m)]	Limit Peak dB(uV/m)	Margin Peak [dB]	Height (m)	Angle (Deg)	Factor [dB(1/m)]	Measure Type/ Result
1	2744.1	Horizontal	41.017	74	-32.983	1	338	2.24	Peak (PASS)
2	2744.1	Horizontal	28.969	54	-25.031	1	338	2.24	Average (PASS)
3	15987.1	Horizontal	43.578	74	-30.422	1	311	8.52	Peak (PASS)
4	15987.1	Horizontal	30.78	54	-23.22	1	311	8.52	Average (PASS)
5	17909.8	Horizontal	45.938	74	-28.062	1.36	281	6.76	Peak (PASS)
6	17909.8	Horizontal	32.631	54	-21.369	1.36	281	6.76	Average (PASS)

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) +Preamplifier
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.

Conducted Emission Measurement

Limits of Conducted Emission Measurement :

The following standards specified below are covered in the scope of this section of the test report:

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

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

Conducted Emissions - Test Procedure

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

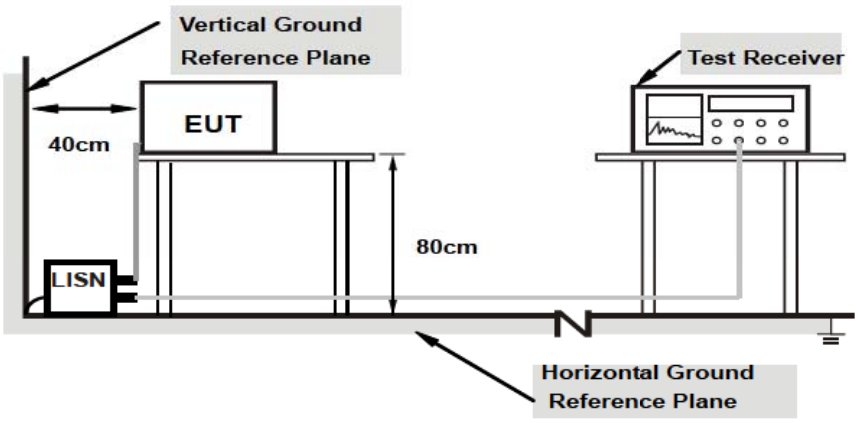
c. The frequency ranges from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Test Equipment List

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

Test Name: CEV			**Test Date(s):** 05/17/2023		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2488	Screen Room	Universal	Custom Made	Not Required	Not Required
1S4818	Digital Barometer	Control Company	6530. 68000-49	05/04/2022	05/04/2024
4U1668	True RMS Multimeter with Remote Display	Fluke	233	04/03/2023	04/03/2025
1S3898	Voltage Regulator	Volteq	TDGC2-5kVA	See Note	See Note
1S3809	EMI Receiver	Narda Safety Test Solutions	PMM 9010F	10/12/2022	10/12/2023
1S4781	Transient Limiter	Fischer Custom Communications, Inc.	450B-2.4-BNC	See Note	See Note
1U0337	LISN	Com-Power	LI-215A	10/12/2022	10/12/2023
1S2659	Impedance Stabilization Network (ISN)	Fischer Custom Communications, Inc.	F-071115-1057-1-09	04/06/2023	04/06/2024
1S54005	Micro-Ohmmeter	NDB Technologies, Inc.	DRM-1A	11/21/2022	11/21/2023
1S4852	Radio Communicator Analyzer	Anritsu	MT8821C	04/10/2023	04/10/2024

Conducted Emissions - Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo)

Test Results:

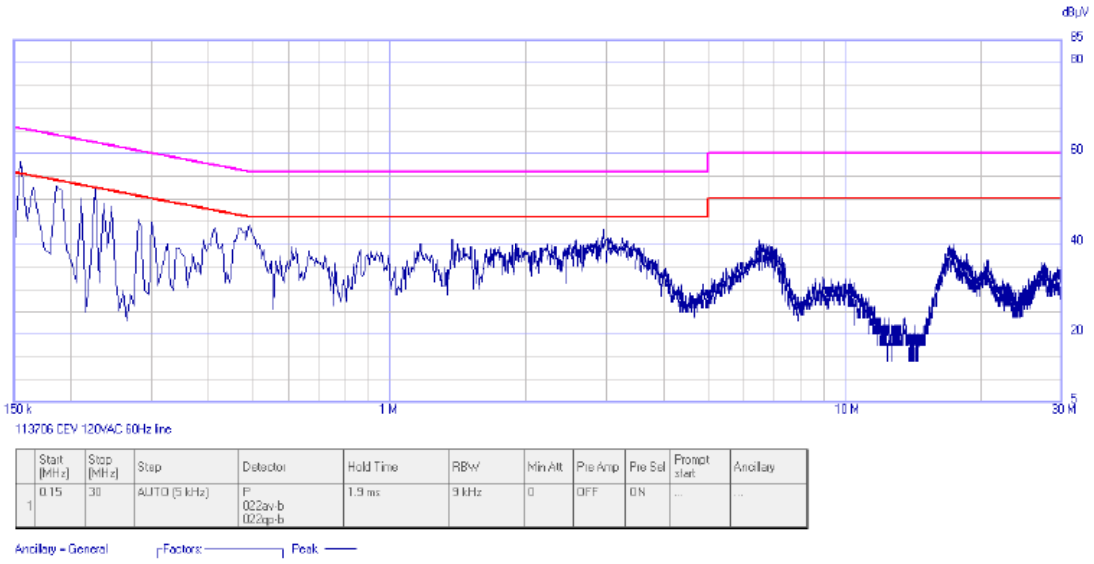
Frequency Range	0.15-30 MHz	Phase	Line
Input Power	120Vdc, 60Hz	Environmental Conditions	24 °C, 48% RH
Tested by	Richard Dollente	Test Date	07/ 27/ 2023
Test Mode	TX MODE		

Line	Freq (MHz)	QP Amplitude (dBµV)	QP Limit (dBµV)	Delta (dB)	Results	Average Amplitude (dBµV)	Average Limit (dBµV)	Delta (dB)	Results
CEV 120vac 60Hz line	0.155	49.63	65.728	-16.098	Pass	30.7	55.728	-25.028	Pass
CEV 120vac 60Hz line	0.165	47.72	65.211	-17.491	Pass	25.04	55.211	-30.171	Pass
CEV 120vac 60Hz line	0.185	47.51	64.263	-16.753	Pass	33.4	54.263	-20.863	Pass
CEV 120vac 60Hz line	0.21	41.98	63.213	-21.233	Pass	19.47	53.213	-33.743	Pass
CEV 120vac 60Hz line	0.225	41.77	62.641	-20.871	Pass	25.01	52.641	-27.631	Pass
CEV 120vac 60Hz line	0.235	40.23	62.281	-22.051	Pass	22.92	52.281	-29.361	Pass

Note(s): * - At this frequency, the measured conducted emission exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, has at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

Remarks:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level – Limit value
3. Emission Level = Correction Factor + Reading Value



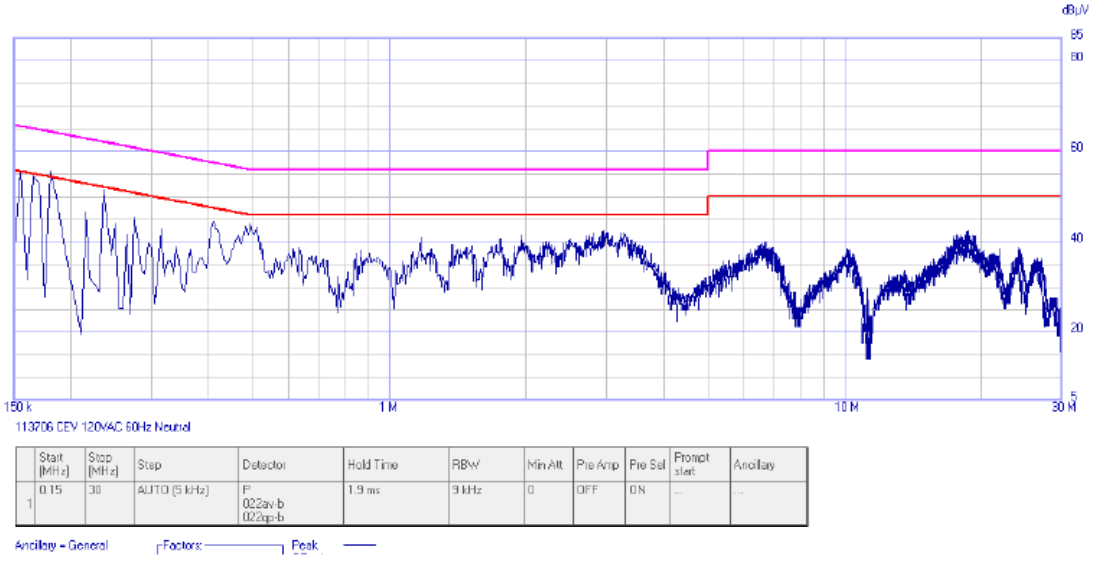
Frequency Range	0.15-30 MHz	Phase	Neutral
Input Power	120Vdc, 60Hz	Environmental Conditions	24 °C, 48% RH
Tested by	Richard Dollente	Test Date	07/ 27/ 2023
Test Mode	Mode 1		

Line	Freq (MHz)	QP Amplitude (dBµV)	QP Limit (dBµV)	Delta (dB)	Results	Average Amplitude (dBµV)	Average Limit (dBµV)	Delta (dB)	Results
CEV 120vac 60Hz Neutral	0.155	49.41	65.728	-16.318	Pass	27.37	55.728	-28.358	Pass
CEV 120vac 60Hz Neutral	0.165	46.21	65.211	-19.001	Pass	23.81	55.211	-31.401	Pass
CEV 120vac 60Hz Neutral	0.18	48.12	64.49	-16.37	Pass	32.89	54.49	-21.6	Pass
CEV 120vac 60Hz Neutral	0.215	41.36	63.018	-21.658	Pass	22.65	53.018	-30.368	Pass
CEV 120vac 60Hz Neutral	0.235	40.47	62.281	-21.811	Pass	22.47	52.281	-29.811	Pass
CEV 120vac 60Hz Neutral	0.155	49.41	65.728	-16.318	Pass	27.37	55.728	-28.358	Pass

Note(s): * - At this frequency, the measured conducted emission exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, has at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.

Remarks:

1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level – Limit value
3. Emission Level = Correction Factor + Reading Value



IV. Pictures of test Arrangements

Please see setup photo file

END OF REPORT

