

October 11, 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, Part 15 Subpart C 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.

Gary Chou

Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIR128382-Track_FCC-LORA



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FCC Test Report

Applicant name: Trackonomy Systems

Product: Gateway Terminal

Report: WIR128383-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

Richard Dollente

Richard Dollente

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
Ø	October 11, 2023	Initial Issue.

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I. Executive Summary

A. Executive Summary

47 CFR FCC Part 15, Subpart C (SECTION 15.247) RSS 247 Issue2, RSS Gen Issue5				
FCC/ IC Cluse	-	Test Item	Result	Remarks
15.207	-	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.205 & 15.209 & 15.247(d)	-	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	-	6dB bandwidth & 99% bandwidth	PASS	Note 1
15.247(b)	-	Conducted power	PASS	Note 1
15.247(e)	-	Power Spectral Density	PASS	Note 1
15.203	-	Antenna Requirement	PASS	Dipole Antenna(fixed and cannot remove) meet the requirement.

Note:

1. Refer to RF module Report FCC ID: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-2003		
Series Model:	N/A		
Sample Status:	Original		
EUT Specifications:	Primary Power:		120 Vac/ 60Hz
	Voltage Frequency:		N/A
	Technology / Type of Modulations:		DTS
	Operating Frequency :		915 MHz
	FCC ID:		2AXA8-GBP-2003
	ISED ID:		27299-GBP2003
	Antenna Brand/ Model		DIAMOND/ NR920
	Antenna Type:	Dipole antenna	Antenna Gain: 7 dBi
	Antenna connector:		N
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:	Richard Dollente		
Issue Date(s):	September 02, 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-2003	Nominal HW V2	Nominal FW V2	Verify by Spectrum Analyzer & Laptop

B. Description of Operator Modes

Channel List:

Channel	Frequency (MHz)	Channel	Frequency
1	915		

Power setting is as below:

Lora	Power Setting
Channel	
1	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
- 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:

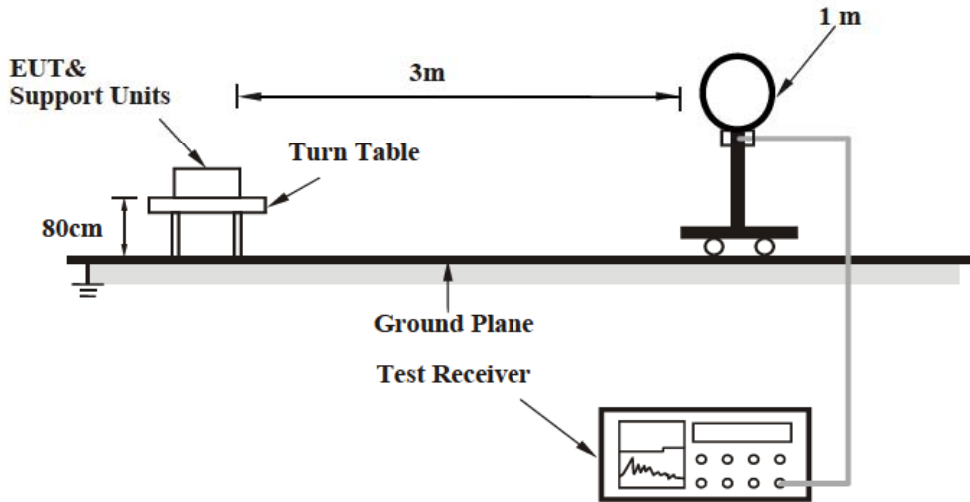
Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Test Procedures:

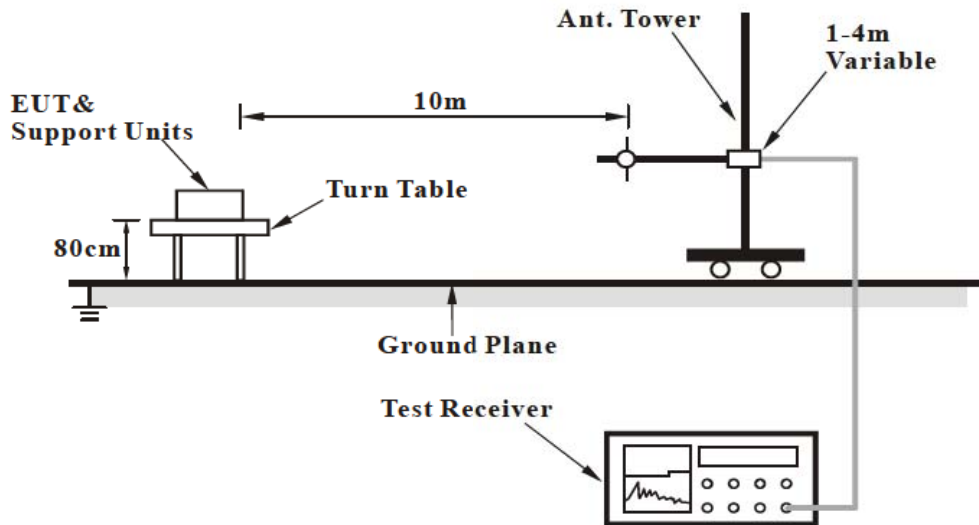
The transmitter was turned on. Measurements were performed of the low, mid and high Channels. The EUT was rotated orthogonally through all three axes. Plots shown are corrected for both antenna correction factor and distance and compared to a 3 m limit line. Only noise floor was measured above 18 GHz.

Test Setup

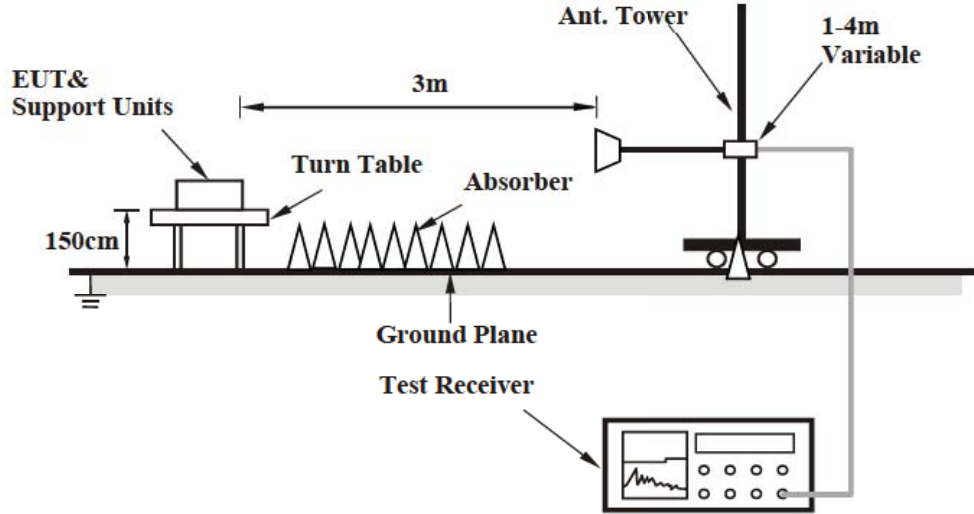
For Radiated Emission Below 30MHz



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

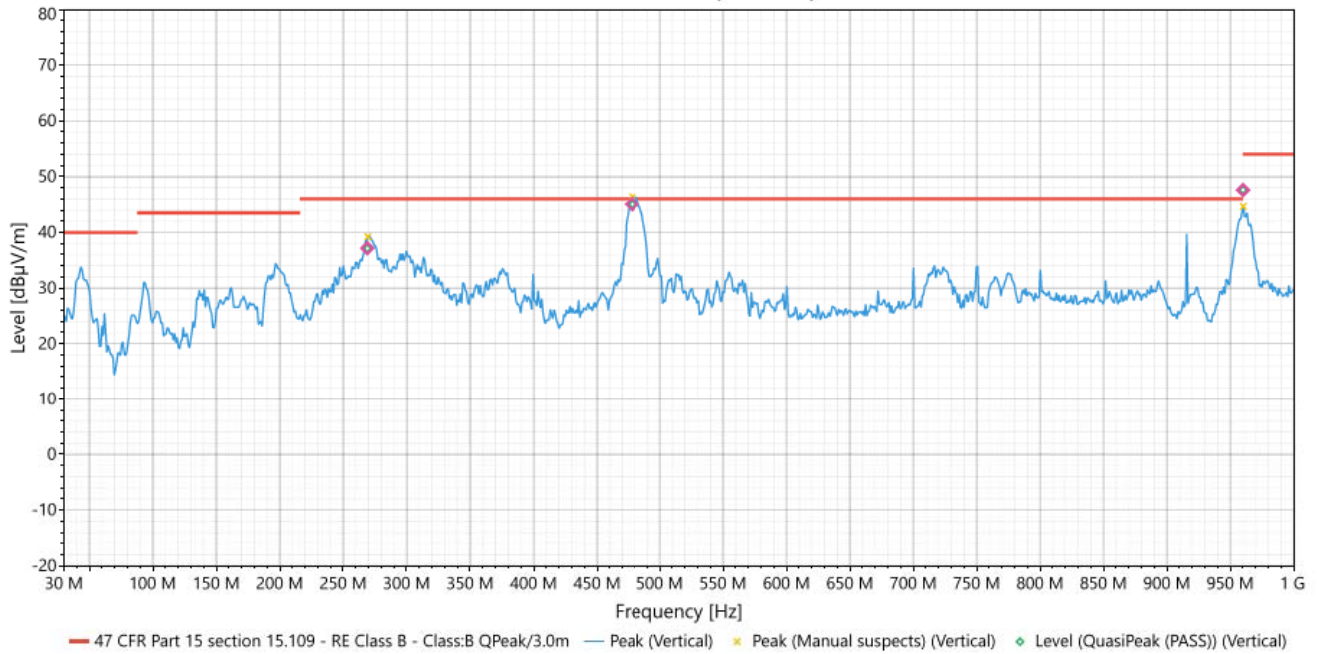
Test Engineer: Richard Dollente

Test Date(s): 09/02/2023

Test Data
Radiated Emissions (30 MHz~1000 MHz)

EUT Test Condition		Measurement Detail	
Input Power	3Vdc	Frequency Range	30MHz-1GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Richard Dollente
Test Mode	TX MODE 915 MHz		

#1 - 30MHz-1GHz (Vertical)



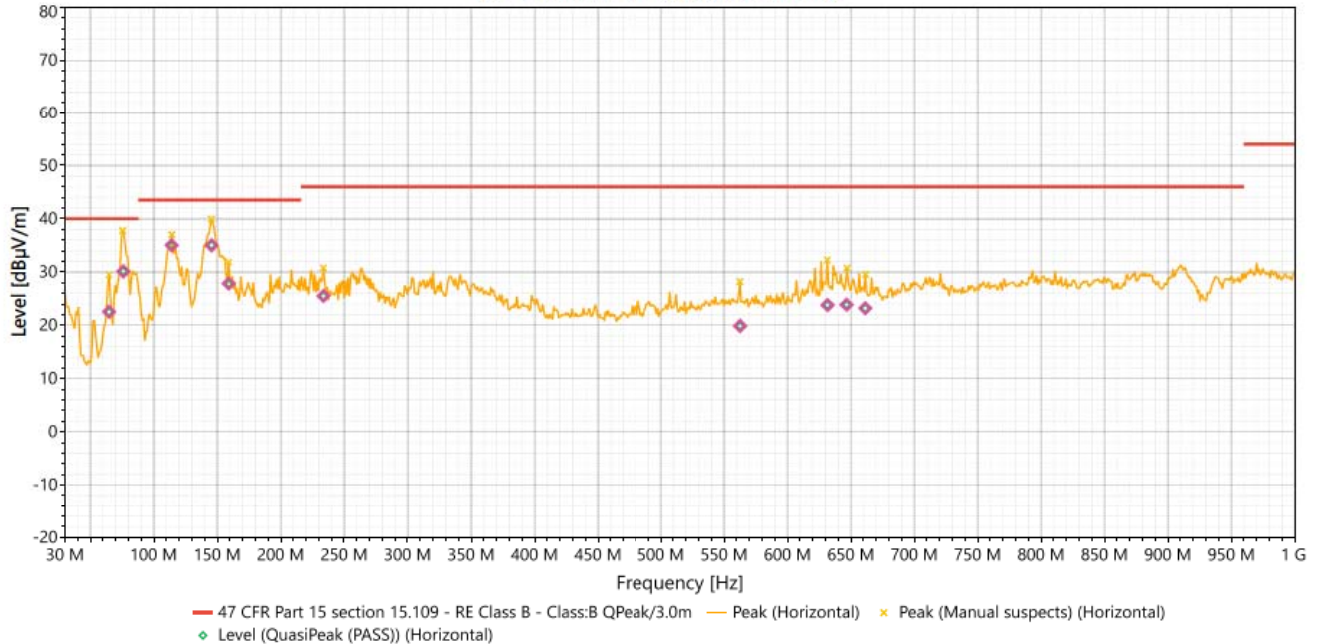
Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (cm)	Angle (Deg)	Factor [dB(1/m)]	Pass/Fail
1	269	Vertical	37.164	46	-8.836	1.57	321	-8	Pass
2	477.62	Vertical	45.048	46	-0.952	2.06	173	-2.65	Pass
3	960	Vertical	47.592	54	-6.408	1.85	315	4.65	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	3Vdc	Frequency Range	30MHz-1GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Richard Dollente
Test Mode	TX MODE 915MHz		

#2 - 30MHz-1GHz (Horizontal)



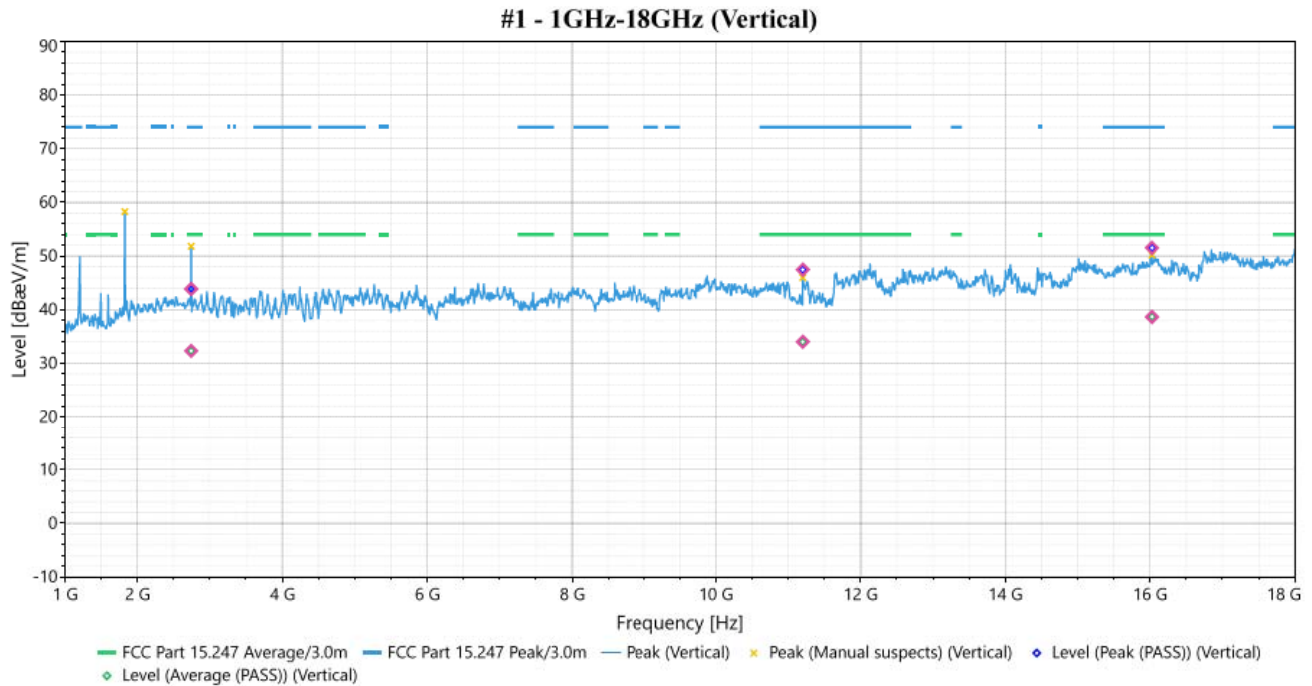
Antenna Polarity & Test Distance: Vertical at 3m									
No.	Frequency (MHz)	Polarization	Level [dB(uV/m)]	Limit dB(uV/m)	Margin [dB]	Height (cm)	Angle (Deg)	Factor [dB(1/m)]	Pass/Fail
1	199.69	Horizontal	36.812	43.5	-6.688	1.03	145	-7.7	Pass
2	482.35	Horizontal	41.813	46	-4.187	1.44	11	-2.43	Pass
3	960.01	Horizontal	49.405	54	-4.595	1.61	342	5.23	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	3Vdc	Frequency Range	1GHz-18GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Richard Dollente
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)]	Measure Type/ Result
1	1829.6	Vertical	58.249	NaN	NaN	NaN	2	0.61	Peak
2	2744.1	Vertical	43.837	74	-30.163	3.5	304	2.21	Peak (PASS)
3	2744.1	Vertical	32.311	54	-21.689	3.5	304	2.21	Average (PASS)
4	11201.6	Vertical	47.458	74	-26.542	3.27	264	6.51	Peak (PASS)
5	11201.6	Vertical	34.023	54	-19.977	3.27	264	6.51	Average (PASS)
6	16026.2	Vertical	51.525	74	-22.475	3.06	78	8.55	Peak (PASS)
7	16026.2	Vertical	38.642	54	-15.358	3.06	78	8.55	Average (PASS)

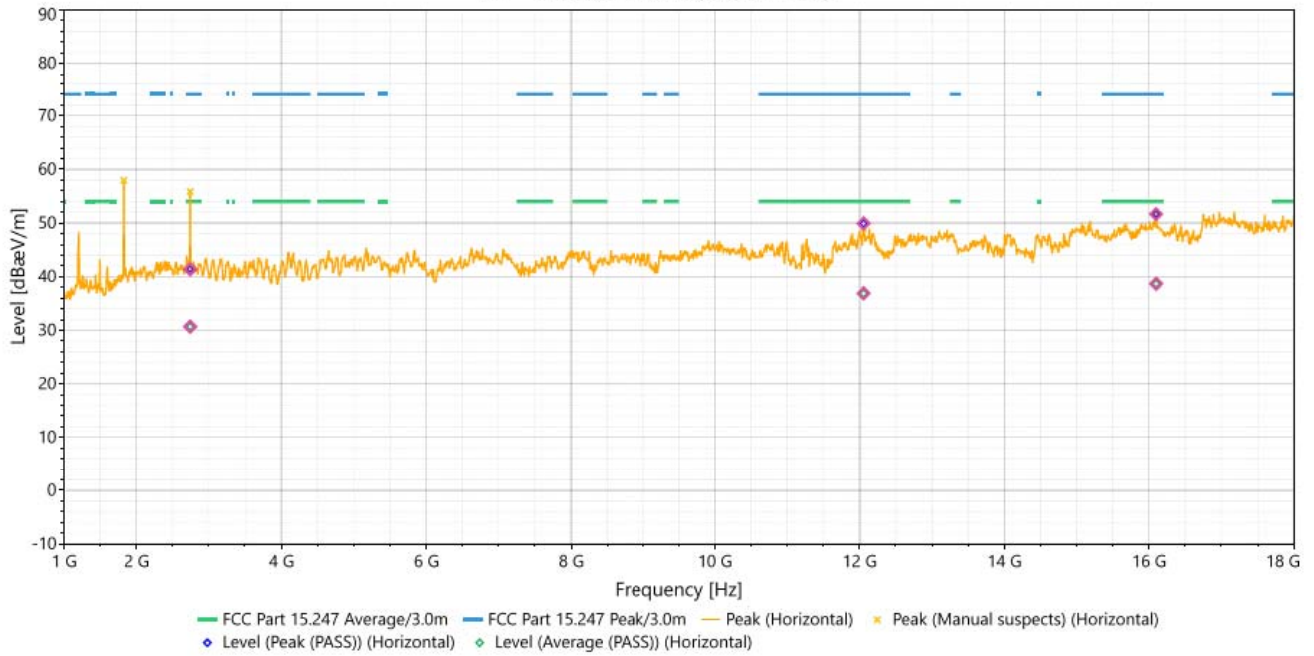
REMARKS:

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.
5. "NaN": Emissions that do not fall within the restricted frequency bands where the attenuation below the general field strength limits specified in FCC§15.205/ RSS-Gen is not required.

EUT Test Condition		Measurement Detail	
Input Power	3Vdc	Frequency Range	1GHz-18GHz
Environmental Conditions	25 deg. C, 70% RH	Tested By	Richard Dollente
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	1829.6	Horizontal	57.921	NaN	NaN	NaN	2	0.58	Peak
2	2744.1	Horizontal	41.359	74	-32.641	1	355	2.24	Peak (PASS)
3	2744.1	Horizontal	30.649	54	-23.351	1	355	2.24	Average (PASS)
4	12056.7	Horizontal	49.909	74	-24.091	3.37	358	7.51	Peak (PASS)
5	12056.7	Horizontal	36.858	54	-17.142	3.37	358	7.51	Average (PASS)
6	16097.6	Horizontal	51.644	74	-22.356	3.5	222	8.53	Peak (PASS)
7	16097.6	Horizontal	38.665	54	-15.335	3.5	222	8.53	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.
5. "NaN": Emissions that do not fall within the restricted frequency bands where the attenuation below the general field strength limits specified in FCC§15.205/ RSS-Gen is not required.

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:

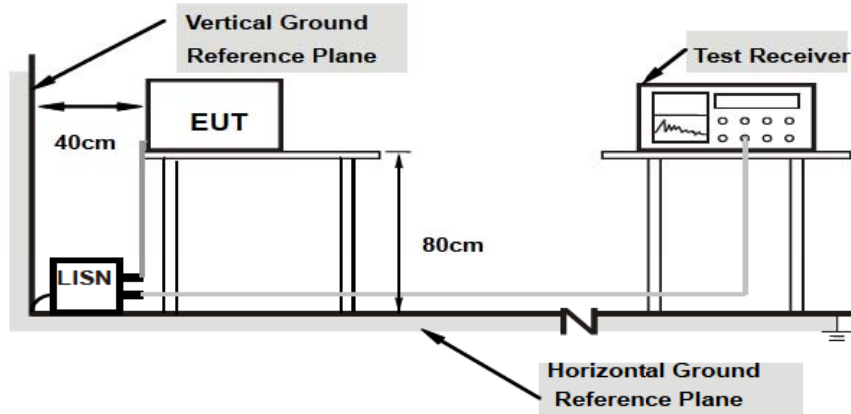
Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

- 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.

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:

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): 9/23/2023		
MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
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	Func Verify	Func Verify
1U0336	LISN	Com-Power	LI-215A	4/6/2023	4/6/2024
1S4818	Digital Barometer	Control Co	6530	5/4/2022	5/4/2024
1S4005	Micro-Ohmmeter	ndb Technologies, Inc	DRM-1A	11/21/2022	11/21/2023
1S2488	Screen Room	Universal	Custom made	Not Required	Not Required

Note: Functional Verification

TEST DATA:

Line	Frequency	OP Amplitude (dBµV)	OP Limit (dBµV)	OP Margin (dB)	Pass/Fail	Average Amplitude (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Pass/Fail
Line	150 kHz	53.77	79	-25.23	Pass	39.93	66	-26.07	Pass
Line	545 kHz	48.968	73	-24.032	Pass	42.148	60	-17.852	Pass
Line	1.13 MHz	30.448	73	-42.552	Pass	24.548	60	-35.452	Pass
Line	3.365 MHz	18.642	73	-54.358	Pass	13.232	60	-46.768	Pass
Line	14.46 MHz	26.687	73	-46.313	Pass	22.747	60	-37.253	Pass
Line	26.56 MHz	28.863	73	-44.137	Pass	24.213	60	-35.787	Pass

Table 1. CEV - (150 kHz – 30 MHz, Phase 1), 120VAC 60Hz - PMM 9010F, Line 1 Test Results

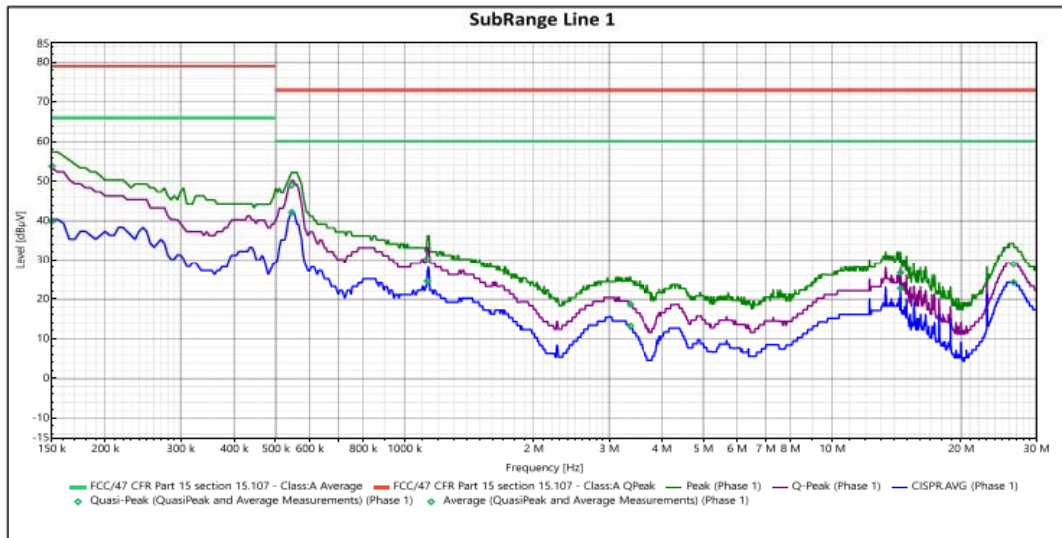


Figure 1. CEV - (150 kHz – 30 MHz, Phase 1), 120VAC 60Hz - PMM 9010F, Line 1 Plot

Line	Frequency	QP Amplitude (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Pass/Fail	Average Amplitude (dBµV)	Average Limit (dBµV)	Average Margin (dB)	Pass/Fail
Neutral	150 kHz	53.28	79	-25.72	Pass	40.7	66	-25.3	Pass
Neutral	555 kHz	49.598	73	-23.402	Pass	41.368	60	-18.632	Pass
Neutral	1.14 MHz	30.709	73	-42.291	Pass	24.399	60	-35.601	Pass
Neutral	3.5 MHz	22.462	73	-50.538	Pass	17.622	60	-42.378	Pass
Neutral	13.345 MHz	25.49	73	-47.51	Pass	23.11	60	-36.89	Pass
Neutral	23.005 MHz	22.305	73	-50.695	Pass	19.505	60	-40.495	Pass

Table 2. CEV - (150 kHz – 30 MHz, Neutral), 120VAC 60Hz - PMM 9010F, Neutral Test Results

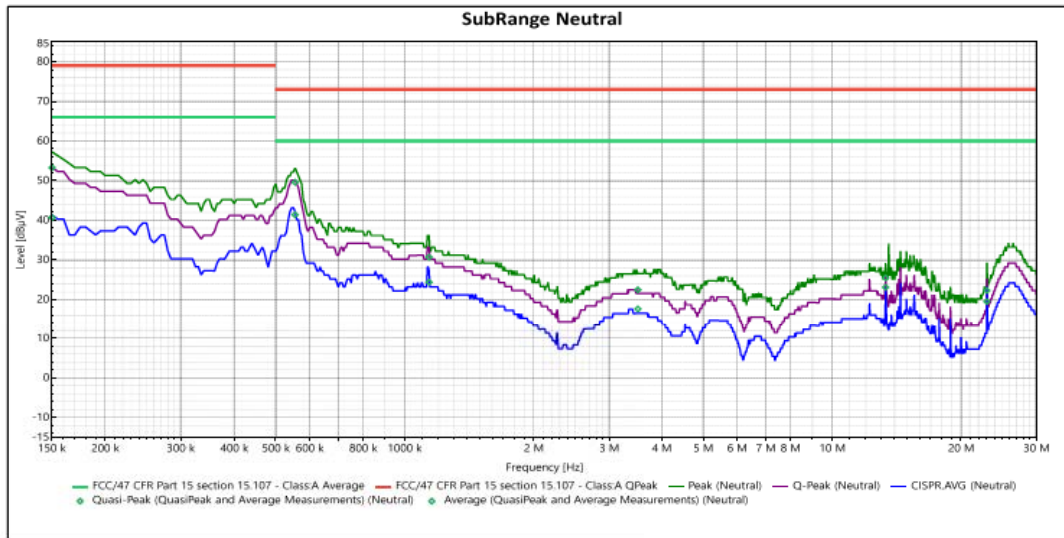


Figure 2. CEV - (150 kHz – 30 MHz, Neutral), 120VAC 60Hz - PMM 9010F, Neutral Plot

IV. Pictures of test Arrangements

Please see setup photo file

END OF REPORT