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5/20/2025

Tractian Technologies Inc.
201 17th Street NW 2nd Floor – Tractian
Atlanta, GA 30363
USA

Dear Jorge Sousa,

Enclosed is the EMC test report for testing of the Tractian Technologies Inc., Omni Receiver tested to the requirements of FCC Part 2.1091

Thank you for using the services of Eurofins E&E North America. If you have any questions regarding these results or if MET can be of further service to you, please do feel free to contact me.

Sincerely,

Nancy LaBrecque
Documentation Department
Eurofins Electrical and Electronic Testing NA, Inc.

Reference: WIRA13506 – MPE_FCC_R1

A2LA ACCREDITED TESTING CERT #0591.06

RF Exposure Criteria
Test Report
Using Maximum Permissible Exposure (MPE) Calculations

for the

Tractian Technologies Inc.
Omni Receiver

Tested under

FCC Part 2.1091

Report: WIRA13506 – MPE_FCC_R1

5/20/2025

Bryan Taylor, Wireless Team Lead
Electromagnetic Compatibility Lab

Nancy LaBrecque
Documentation Department

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.

Matthew Hinojosa
EMC Manager, Austin Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
0	4/8/2025	Initial Issue.
1	5/20/2025	Addressing TCB reviewer comments

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
CISPR	**C**omite **I**nternational **S**pecial des **P**erturbations **R**adioelectriques (International Special Committee on Radio Interference)
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**er**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**H**er**z**
kPa	**k**ilo**Pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**H**ertz
µ**H**	**micro**H**enry**
µ**F**	**micro**F**arad**
µ**s**	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

1.0 Requirements Summary

Page Number	Test Name	Result
13	FCC Part 2.1091 MPE Limits (For General Public Exposure)	**Compliant**

Table 1. Summary of Test Results

2.0 Equipment Configuration

2.1 Overview

Eurofins MET Labs was contracted by Tractian Technologies Inc. to perform testing on the Omni Receiver, under Tractian Technologies Inc.'s purchase order number 1009.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Tractian Technologies Inc. Omni Receiver.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Omni Receiver	
Model(s) Covered:	Omni Receiver	
Serial Number or Sample Number:	25296-1, 25296-2	
EUT Specifications:	Primary Power: 10 – 30VDC	
	Antenna Gain[1]:	915MHz ISM Transmitter: 2.1dBi
		WiFi Transmitter: 4.9dBi
		LTE Transmitter: 4.9dBi
	EUT Frequency Ranges:	915MHz ISM Transmitter: 905MHz – 923MHz
		WiFi Transmitter: 2412MHz – 2462MHz
		LTE Transmitter: Band 2: 1850 – 1910MHz Band 4: 1710 – 1755MHz Band 5: 824 – 849MHz Band 12: 699 – 716MHz Band 13: 777 – 787MHz Band 25: 1850 – 1915MHz Band 26: 814 – 849MHz Band 41: 2496 – 2690MHz Band 66: 1710 – 1780MHz
	Maximum Conducted Output Power:	915MHz ISM Transmitter: 20dBm
		WiFi Transmitter: 27.00dBm (obtained from module RF Exposure report)
		LTE Transmitter: 25.00dBm (obtained from module RF exposure report)
	Preapproved Modules Onboard:	WiFi Transmitter: FCCID: 2AC7Z-ESP32WROVERE ICID: 21098-ESPWROVERE
		LTE Transmitter: FCCID: 2AJYU-8PYA008 ICID: 23761-8PYA009
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Type of Filing:	Original	
Evaluated by:	Bryan Taylor	
Report Date(s):	5/20/2025	

Table 2. EUT Summary Table

[1] The antenna gain information was provided by Tractian Technologies Inc. at the time of testing.

2.2 Test Site

All testing was performed at Eurofins MET Labs, 13501 McCallen Pass, Austin, TX 78753. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 10 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

FCC Lab Info:
Designation Number: US1127

2.3 References

FCC Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.

Table 3. References

2.4 Description of Test Sample

The Omni Receiver is a Gateway that collects data from Tractian's IOT sensors and sent to the Tractian platform using LTE networks or Wi-Fi. The LTE and WiFi radios are preapproved modules (FCCID: 2AJYU-8PYA008, ICID: 23761-8PYA009 and FCCID: 2AC7Z-ESP32WROVERE, ICID: 21098-ESPWROVERE).

2.5 Modifications

2.5.1 Modifications to EUT

No modifications were made to the EUT.

2.5.2 Modifications to Test Standard

No modifications were made to the test standard.

2.6 Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Tractian Technologies Inc. upon completion of testing.

3.0 Maximum Permissible Exposure Results

3.1 FCC Exposure Limits

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*($900/f^2$)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*($180/f^2$)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Test Procedure:

An MPE evaluation for was performed in order to show that the device was compliant with the general population exposure limits. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$ConductedPower_{mW} = 10^{ConductedBwer(dBm)/10}$$

$$PowerDensity = \frac{ConductedPower_{mW} \times Ant.Gain}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.

Test Results:

The Omni Receiver was **compliant** with FCC Part 2.1091 . The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC Part 2.1091 .

Additionally, the sum of the worst case for each MPE to Limit ratio is less than 1 indicating that all radios may transmit simultaneously. Per information provided by Tractian Technologies Inc. the 915MHz ISM radio may transmit simultaneously with either the LTE module or the WiFi module onboard. However, the LTE and WiFi modules will never transmit simultaneously with each other. Data is presented for both simultaneous transmission scenarios.

Test Data:

Duty Cycle	100 (%)							
Separation Dist.	20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm^2)	MPE Limit (mW/cm^2)	Margin to Limit (mW/cm^2)	MPE / Limit Ratio (for Co-Location)
915MHz ISM	915.00	20.00	20.00	2.10	0.0323	0.6100	0.5777	0.0529
LTE Band 5	849.00	25.00	25.00	4.90	0.1944	0.5660	0.3716	0.3435
							Sum:	0.3964

FCC MPE Data (915MHz ISM and Worst Case LTE)

Duty Cycle	100 (%)							
Separation Dist.	20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm^2)	MPE Limit (mW/cm^2)	Margin to Limit (mW/cm^2)	MPE / Limit Ratio (for Co-Location)
915MHz ISM	915.00	20.00	20.00	2.10	0.0323	0.6100	0.5777	0.0529
2.4GHz WiFi	2412.00	27.00	27.00	4.90	0.3081	1.0000	0.6919	0.3081
							Sum:	0.3610

FCC MPE Data (915MHz ISM and Worst Case WiFi)

Test Engineer(s): Bryan Taylor

Test Date(s): 3/4/2025