TEST REPORT

Applicant:	Particle Industries, Inc.
EUT Description:	Tachyon
Model:	TACH4ROW, TACH8ROW
Brand:	Particle
Standards:	ETSI EN 303 413 V1.2.1
Date of Receipt:	2025/06/25
Date of Test:	2025/06/25 to 2025/08/27
Date of Issue:	2025/08/28

TOWE. 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 the model are manufactured with identical electrical and mechanical components. All sample 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. without written approval of TOWE, the test report shall not be reproduced except in full.

Jim Huang
Approved By:

Carey Chen
Reviewed By:

Revision History

Rev.	Issue Date	Description	Revised by
01	2025/08/28	Original	Carey Chen

Summary of Test Results

Test Item	Test Requirement	Test Method	Result
Receiver blocking	Clause 4.2.1	Clause 5.4	Reference report 2406RSU046-E13
Receiver spurious emissions	Clause 4.2.2	Clause 5.5	Pass

Remark: In this report the Receiver spurious emissions was tested, and the other data please refer to the previous report with report number 2406RSU046-E13 issued by MRT Technology (Suzhou) Co., Ltd.

Table of Contents

1 General Description

1.1 Lab Information

1.1.1 Testing Location

These measurements tests were conducted at the Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. facility located at F401 and F101, Building E, Hongwei Industrial Zone, Liuxian 3rd Road, Bao'an District, Shenzhen, China.
Tel.: +86-755-27212361
Contact Email: info@towewireless.com

1.1.2 Test Facility / Accreditations

A2LA (Certificate Number: 7088.01)
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

FCC Designation No.: CN1353
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized as an accredited testing laboratory. Designation Number: CN1353.

ISED CAB identifier: CN0152
Sushi TOWE Wireless Testing(Shenzhen) Co., Ltd. has been recognized by ISED as an accredited testing laboratory.
CAB identifier: CN0152
Company Number: 31000

1.2 Client Information

1.2.1 Applicant

Applicant:	Particle Industries, Inc.
Address:	548 Market St, PMB 34833, San Francisco, CA 94104, USA

1.2.2 Manufacturer

Manufacturer:	Particle Industries, Inc.
Address:	548 Market St, PMB 34833, San Francisco, CA 94104, USA

1.3 Product Information

<table>
<tr><td>EUT Description:</td><td colspan="3">Tachyon</td></tr>
<tr><td>Model:</td><td colspan="3">TACH4ROW, TACH8ROW</td></tr>
<tr><td>Brand:</td><td colspan="3">Particle</td></tr>
<tr><td>Hardware Version:</td><td colspan="3">V1.2</td></tr>
<tr><td>Software Version:</td><td colspan="3">1.0.160</td></tr>
<tr><td>IMEI:</td><td colspan="3">863174060029047</td></tr>
<tr><td rowspan="15">GNSS Type:</td><td>Constellation</td><td>Signal Designations</td><td>Frequency Band (MHz)</td></tr>
<tr><td rowspan="2">☒BDS</td><td>☒B1I</td><td rowspan="2">1559MHz ~ 1610MHz</td></tr>
<tr><td>☐B1C</td></tr>
<tr><td rowspan="3">☒Galileo</td><td>☒E1</td><td>1559MHz ~ 1610MHz</td></tr>
<tr><td>☒E5a</td><td rowspan="2">1164MHz ~ 1215MHz</td></tr>
<tr><td>☐E5b</td></tr>
<tr><td>☐E6</td><td>1215MHz ~ 1300MHz</td></tr>
<tr><td rowspan="2">☒GLONASS</td><td>☒G1</td><td>1559MHz ~ 1610MHz</td></tr>
<tr><td>☐G2</td><td>1215MHz ~ 1300MHz</td></tr>
<tr><td rowspan="4">☒GPS</td><td>☒L1 C/A</td><td>1559MHz ~ 1610MHz</td></tr>
<tr><td>☐L1C</td><td>1559MHz ~ 1610MHz</td></tr>
<tr><td>☐L2C</td><td>1215MHz ~ 1300MHz</td></tr>
<tr><td>☒L5</td><td>1164MHz ~ 1215MHz</td></tr>
<tr><td rowspan="2">☒SBAS</td><td>☒L1</td><td>1559MHz ~ 1610MHz</td></tr>
<tr><td>☐L5</td><td>1164MHz ~ 1215MHz</td></tr>
<tr><td>Antenna Type:</td><td colspan="3">☐ External, ☒ Integrated</td></tr>
<tr><td colspan="4">Remark:
1. The above EUT's information was declared by applicant, please refer to the specifications or user's manual for more detailed description.
2. According to the customer's Letter of model difference, TACH4ROW and TACH8ROW are identical with each other, except for RAM and model number difference.</td></tr>
</table>

2 Test Configuration

2.1 Standards Specification

Reference Standards	Standards Title
ETSI EN 303 413 V1.2.1	Satellite Earth Stations and Systems (SES); Global Navigation Satellite System (GNSS) receivers; Radio equipment operating in the 1164 MHz to 1300 MHz and 1559 MHz to 1610 MHz frequency bands; Harmonised Standard for access to radio spectrum

2.2 Test Environment

Relative Humidity	45-56 % RH Ambient	
Condition	**Temperature(℃)**	**Voltage(V)**
NTNV	25	4.00
Remark:		
NTNV Normal Temperature Normal Voltage		

2.3 Support Unit used in test

The EUT has been tested as an independent unit.

2.4 Test RF Cable

For all conducted test items: The offset level is set spectrum analyzer to compensate the RF cable loss and attenuator factor between RF conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level will be exactly the RF output level.
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.

2.5 Modifications

No modifications were made during testing.

3 Equipment and Measurement Uncertainty

All test and measuring equipment utilized to perform the tests documented in this report are calibrated on a regular basis, whichever is less, and where applicable is traceable to recognized national standards.

3.1 Test Equipment List

Radiated Emission					
Description	**Manufacturer**	**Model**	**S.N.**	**Last Due**	**Cal. Due**
Biconic Logarithmic Periodic Antennas	Schwarzbeck	VULB9163	1461	2023/06/25	2026/06/24
Double-Ridged Horn Antennas	Schwarzbeck	BBHA 9120D	2814	2023/06/25	2026/06/24
Signal Analyzer	Keysight	N9020A	US46470366	2025/03/11	2026/03/10
Low Noise Amplifier	Tonscend	TAP9K3G40	AP23A8060274	2025/03/11	2027/03/10
Low Noise Amplifier	Tonscend	TAP01018050	AP23A8060268	2025/03/11	2027/03/10
Band Reject Filter Group	Tonscend	JS0806-F	23A806F0654	N/A	N/A
Test Software	Tonscend	TS+	Version: 5.0.0	N/A	N/A

3.2 Measurement Uncertainty

Parameter	U_{lab}
Radiation 30MHz~1GHz(FAR)	4.48dB
Radiation 1GHz~18GHz(FAR)	5.30dB

Uncertainty figures are valid to a confidence level of 95%

4 Test results

4.1 Receiver spurious emissions

Test Requirement:	ETSI EN 303 413 Clause 4.2.2
Test Method:	ETSI EN 303 413 Clause 5.5

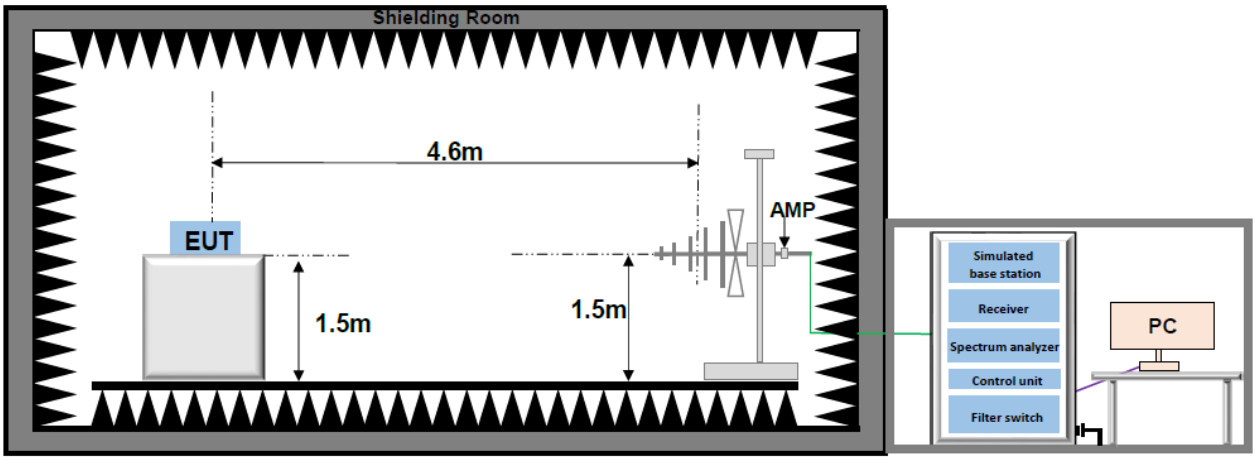
Limit:
The receiver spurious emissions of the GUE shall not exceed the values given in table 4-5.
In case of a GUE with an external antenna connector, these limits apply to emissions at the antenna port (conducted). For emissions radiated by the cabinet or for emissions radiated by a GUE with an integral antenna (without an antenna connector), these limits are e.r.p. for emissions up to 1 GHz and e.i.r.p. for emissions above 1 GHz.

Table 4-5: Receiver spurious emission limits

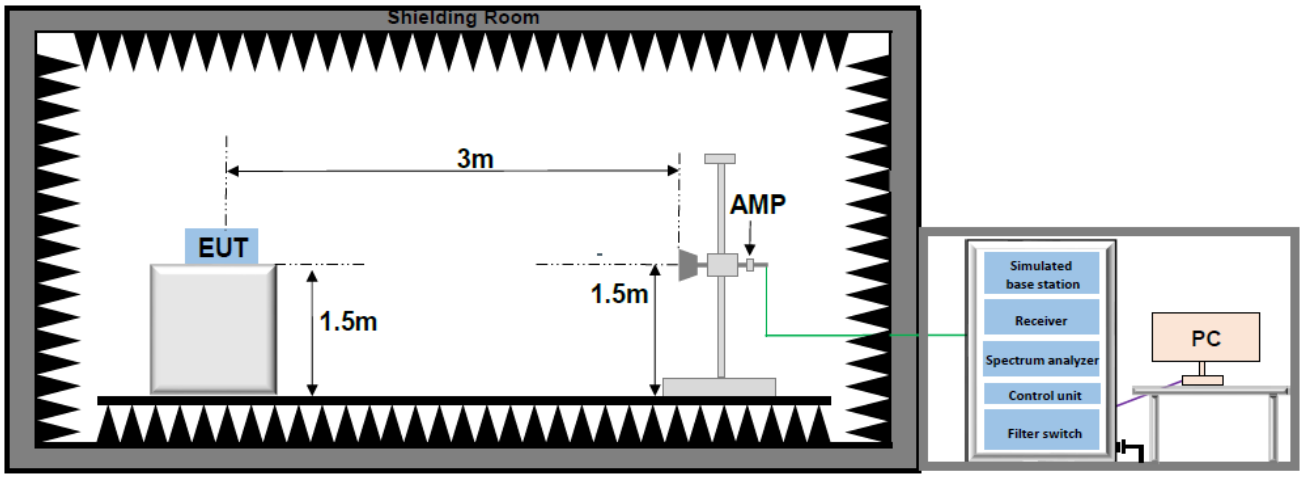
Frequency range	Maximum power	Bandwidth
30MHz ~ 1GHz	-57dBm	100kHz
1GHz ~ 8.3GHz	-47dBM	1MHz

Test Environment:	Refer to section 2.2
Measuring Instruments:	Refer to section 3.1
Test Procedure:	1. The test distance between the receiving antenna and the EUT is 4.6m below 1GHz frequency range, and 3m which is in far field test condition for measured frequency above 1GHz, while the receiving (test) antenna scanning 1.5m height. 2. The EUT was placed on a turntable with 1.5m height (FAR). 3. Set EUT in continuous transmitting with maximum output power. 4. The table was rotated from 0 to 360 degree to search the highest radiated emission. 5. Repeat above step for each polarization and channel to find the worst emission level. 6. The results obtained are compared to the limits in order to prove compliance with the requirement.

Test Setup:



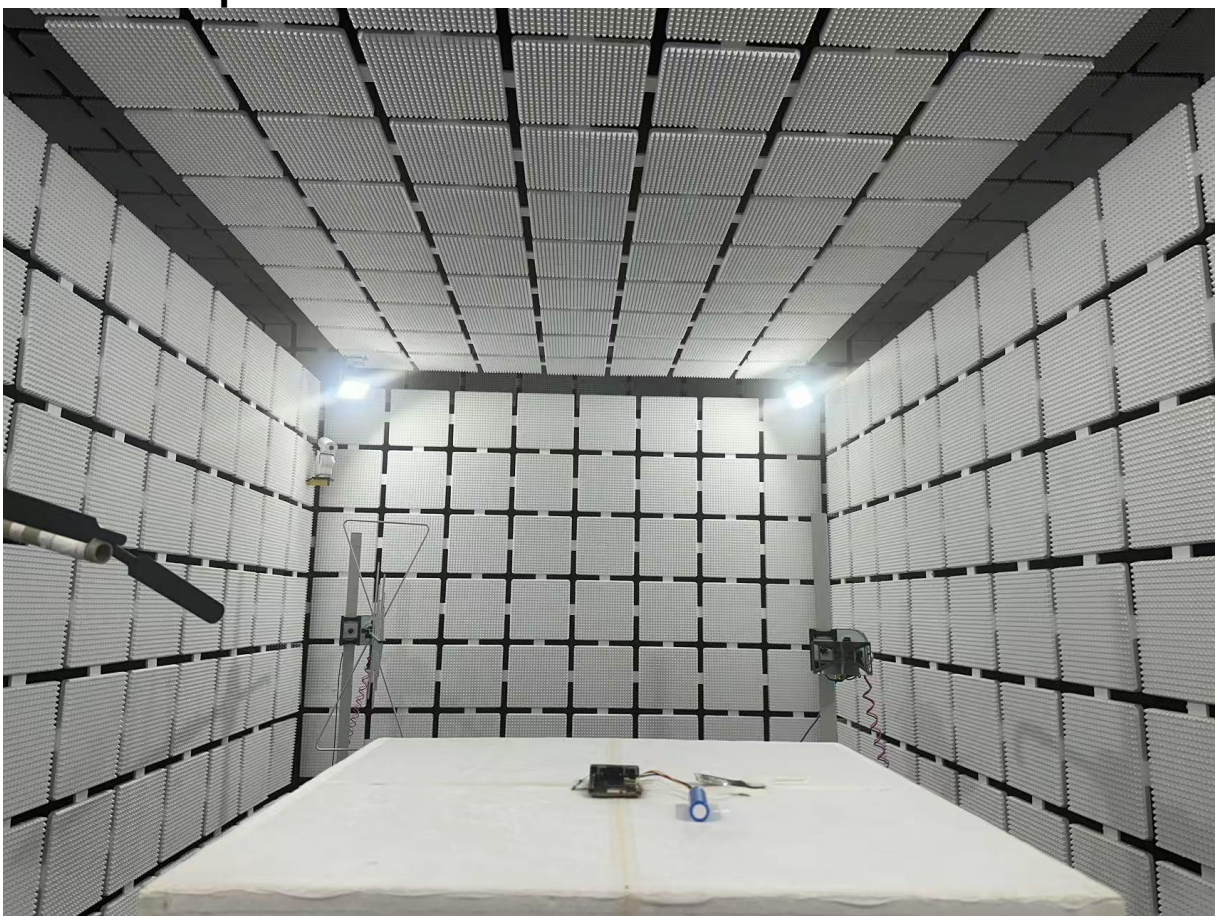
Below 1GHz



Above 1GHz

Test Result:	Appendix

5 Test Setup Photos

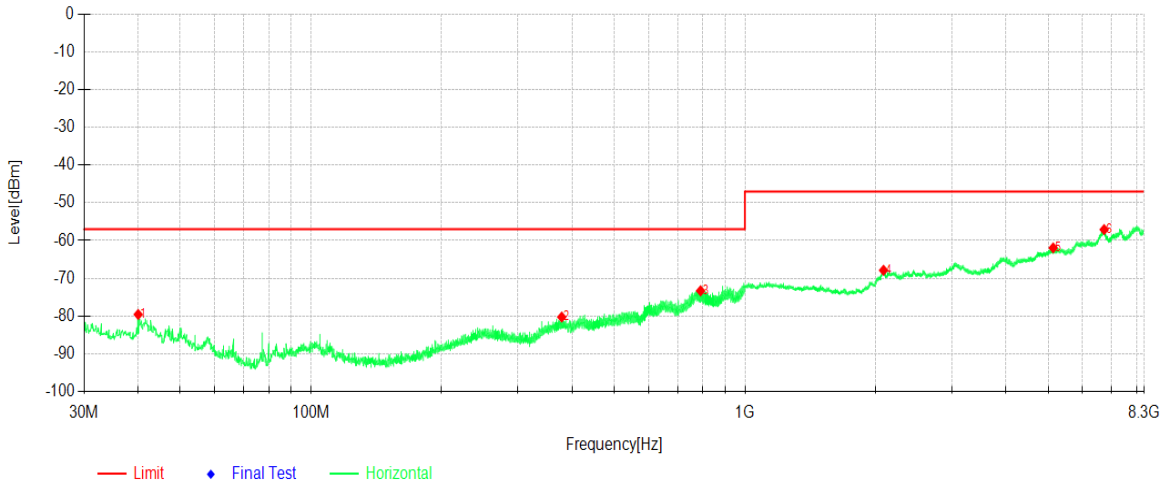


Appendix

Receiver spurious emissions (Worst case)

Project Information			
Mode:	GNSS	Band:	-
Bandwidth:	-	Channel:	-
IMEI:	863174060029047	Engineer:	Zhang Weizhi
Remark:			

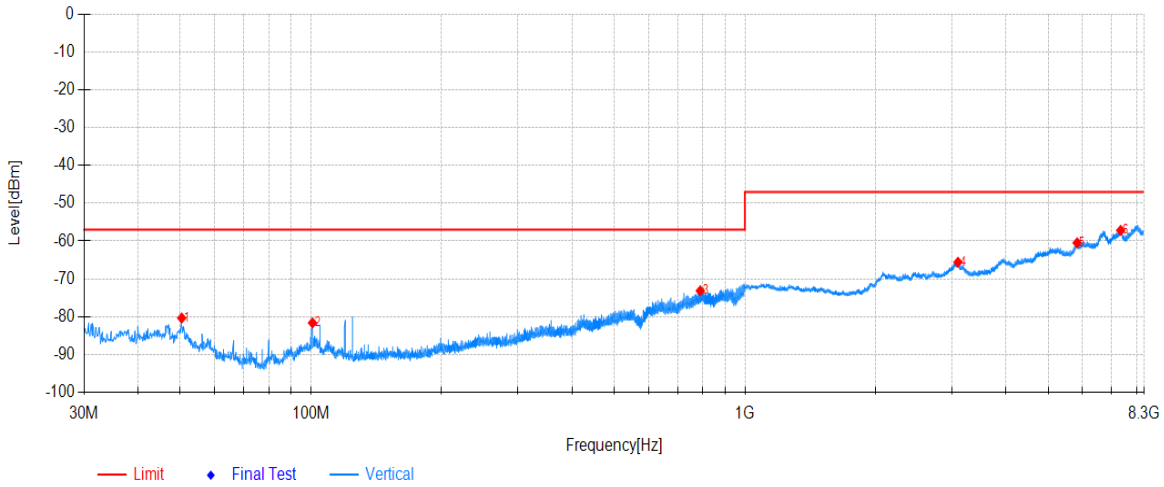
Test Graph



Data List							
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	39.99	-68.30	-79.60	-57.00	22.60	-11.30	Horizontal
2	378.36	-72.22	-80.29	-57.00	23.29	-8.07	Horizontal
3	790.36	-73.92	-73.32	-57.00	16.32	0.60	Horizontal
4	2086.35	-60.54	-67.88	-47.00	20.88	-7.34	Horizontal
5	5132.94	-64.79	-61.94	-47.00	14.94	2.85	Horizontal
6	6726.69	-65.68	-57.08	-47.00	10.08	8.60	Horizontal

Project Information			
Mode:	GNSS	Band:	-
Bandwidth:	-	Channel:	-
IMEI:	863174060029047	Engineer:	Zhang Weizhi
Remark:			

Test Graph



Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	50.37	-69.40	-80.37	-57.00	23.37	-10.97	Vertical
2	100.82	-68.51	-81.66	-57.00	24.66	-13.15	Vertical
3	789.10	-73.65	-73.17	-57.00	16.17	0.48	Vertical
4	3096.77	-62.60	-65.60	-47.00	18.60	-3.00	Vertical
5	5828.70	-65.68	-60.47	-47.00	13.47	5.21	Vertical
6	7343.60	-66.73	-57.19	-47.00	10.19	9.54	Vertical

~The End~