TEST REPORT

Applicant:	Particle Industries, Inc.
EUT Description:	Tachyon
Model:	TACH4ROW, TACH8ROW
Brand:	Particle
Standards:	ETSI EN 300 328 V2.2.2
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
Geo-location capability	Clause 4.3.2.12	Clause 4.3.2.12	Reference report 2406RSU046-E6
RF Output Power	Clause 4.3.2.2	Clause 5.4.2.2.1.2	
Power Spectral Density	Clause 4.3.2.3	Clause 5.4.3.2.1	
Occupied Channel Bandwidth	Clause 4.3.2.7	Clause 5.4.7.2.1	
Transmitter unwanted emissions in the out-of-band domain	Clause 4.3.2.8	Clause 5.4.8.2.1	
Receiver Blocking	Clause 4.3.2.11	Clause 5.4.11.2	
Adaptivity	Clause 4.3.2.6	Clause 5.4.6.2	
Transmitter unwanted emissions in the spurious domain	Clause 4.3.2.9	Clause 5.4.9.2	Pass
Receiver spurious emissions	Clause 4.3.2.10	Clause 5.4.10.2	Pass

Remark: In this report the Radiated Spurious Emissions was tested, and the other data please refer to the previous report with report number 2406RSU046-E6 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

EUT Description:	Tachyon	
Model:	TACH4ROW, TACH8ROW	
Brand:	Particle	
Hardware Version:	V1.2	
Software Version:	1.0.160	
IMEI:	863174060029047	
Bluetooth version:	Bluetooth V5.2	
Support Mode:	☒LE 1M PHY:1Mbps	☒LE 2M PHY:2Mbps
Modulation Type:	GFSK	
Frequency Range:	2400 ~ 2483.5MHz	
Channel Frequency:	2402 ~ 2480MHz	
Channel Number:	40	
Antenna Type:	☐ External, ☒ Integrated	
Antenna Gain:	Ant (dBi)	
	-0.3	

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.

2 Test Configuration

2.1 Standards Specification

Reference Standards	Standards Title
ETSI EN 300 328 V2.2.2	Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

2.2 Test Channel

Test Channel	Test Frequency
The Lowest channel(CH0)	2402MHz
The Middle channel(CH19)	2440MHz
The Highest channel(CH39)	2480MHz

2.3 Test Mode

Modulation Type	LE 1M PHY	LE 2M PHY
Transmitting mode	Keep the EUT was programmed to be in continuously transmitting mode	
Normal Link	Keep the EUT operation to normal function.	

2.4 Test Environment

Relative Humidity	45-56 % RH Ambient	
Condition	**Temperature(℃)**	**Voltage(V)**
NTNV	25	4.00
LTNV	-20	4.00
HTNV	60	4.00
Remark:		
NTNV Normal Temperature Normal Voltage		
LTNV Low Temperature Normal Voltage		
HTNV High Temperature Normal Voltage		

2.5 Support Unit used in test

The EUT has been tested as an independent unit.

2.6 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.

2.7 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
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	1291	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
Low Noise Amplifier	Tonscend	TAP18040048	AP22G806249	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

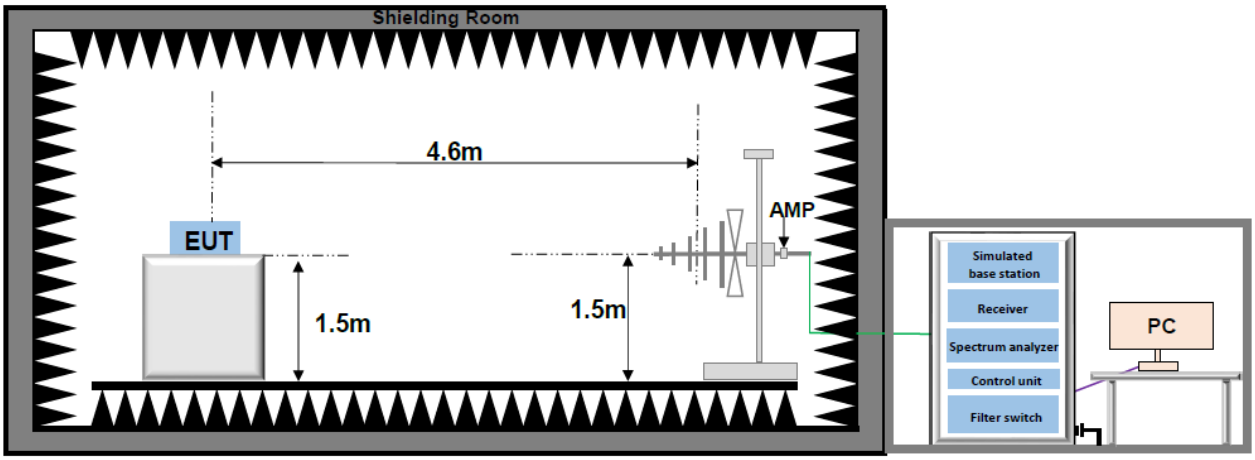
Parameter	Ulab
Radiation 30MHz~1GHz(FAR)	4.48dB
Radiation 1GHz~18GHz(FAR)	5.30dB
Radiation 18GHz~40GHz(FAR)	5.26dB

Uncertainty figures are valid to a confidence level of 95%

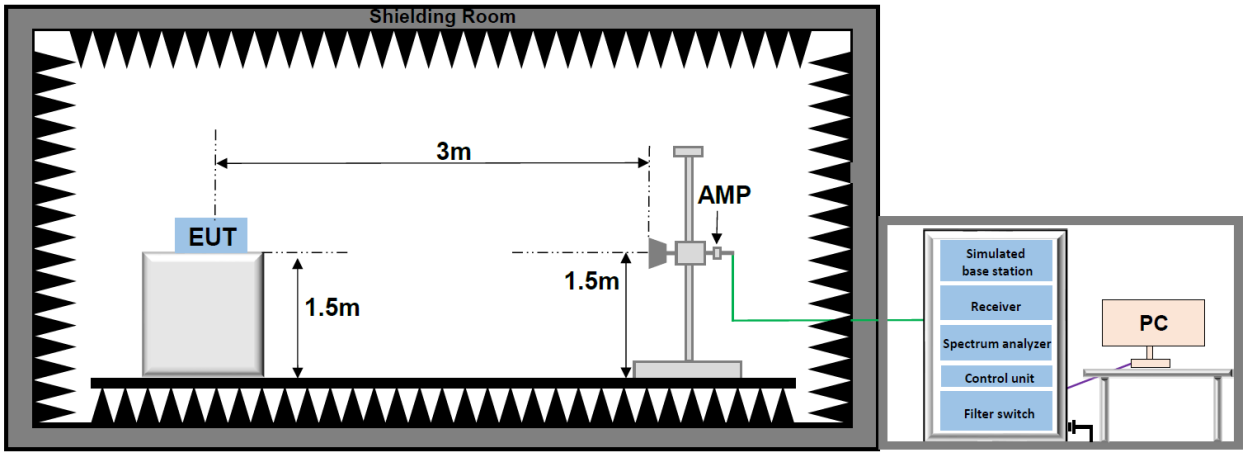
4 Test Results

4.1 Transmitter unwanted emissions in the spurious domain

Test Requirement:	ETSI EN 300 328 Clause 4.3.2.9		
Test Method:	ETSI EN 300 328 Clause 5.4.9.2		
Measurement Distance:	3m		
Limit:	**Table 1: Transmitter limits for spurious emissions**		
	Frequency range	**Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)**	**Bandwidth**
	30 MHz to 47 MHz	-36dBm	100 kHz
	47 MHz to 74 MHz	-54dBm	100 kHz
	74 MHz to 87,5 MHz	-36dBm	100 kHz
	87,5 MHz to 118 MHz	-54dBm	100 kHz
	118 MHz to 174 MHz	-36dBm	100 kHz
	174 MHz to 230 MHz	-54dBm	100 kHz
	230 MHz to 470 MHz	-36dBm	100 kHz
	470 MHz to 694 MHz	-54dBm	100 kHz
	694 MHz to 1 GHz	-36dBm	100 kHz
	1 GHz to 12,75 GHz	-30dBm	1MHz
Test Environment:	Refer to section 2.4.		
Measuring Instruments:	Refer to section 3.1		
Test Procedure:	1. The test distance between the receiving antenna and the EUT is 4.6 m 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

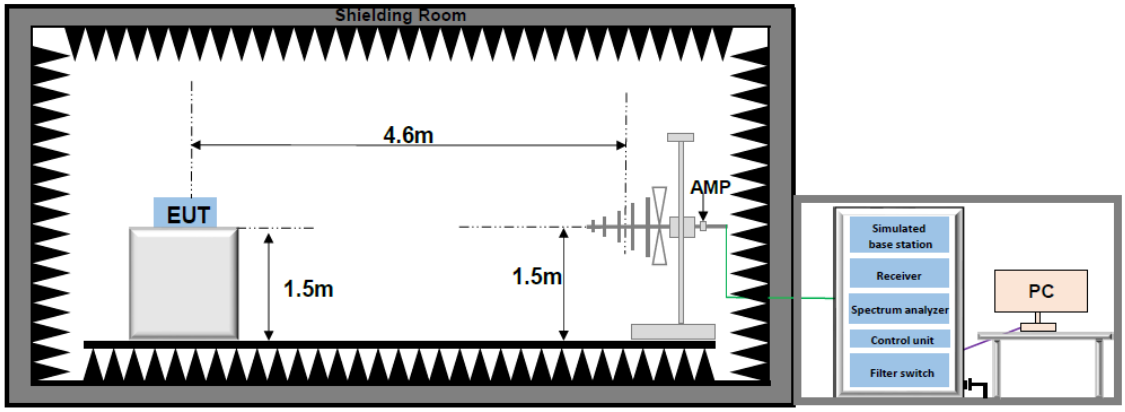
Test Result:	Appendix
Remark:	Transmitter unwanted emissions in the spurious domain were performed with the EUT set to transmit at the worst-case mode/channel based on power and PSD.

4.2 Receiver spurious emissions

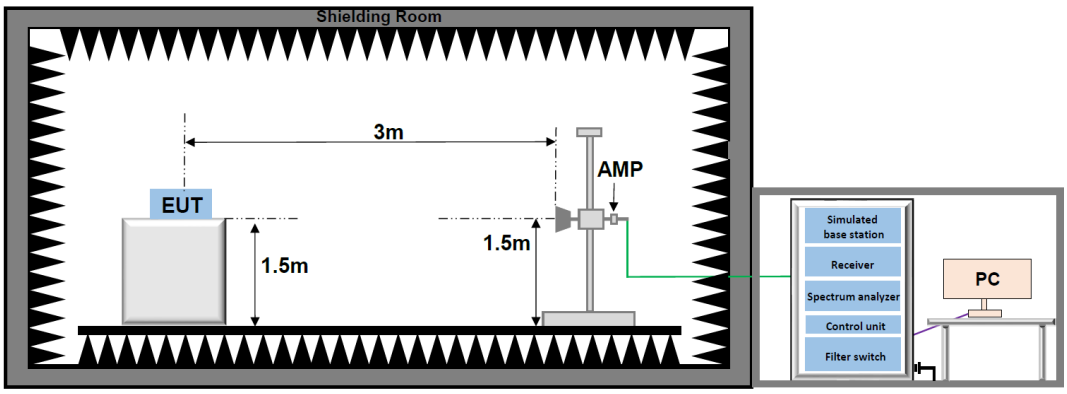
Test Requirement:	ETSI EN 300 328 Clause 4.3.2.10
Test Method:	ETSI EN 300 328 Clause 5.4.10.2
Measurement Distance:	3m
Limit:	The spurious emissions of the receiver shall not exceed the values in tables in the indicated bands:

Frequency Range	Limit
30MHz to 1GHz	-57dBm
Above 1GHz	-47dBm

Test Environment:	Refer to section 2.4.
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:	



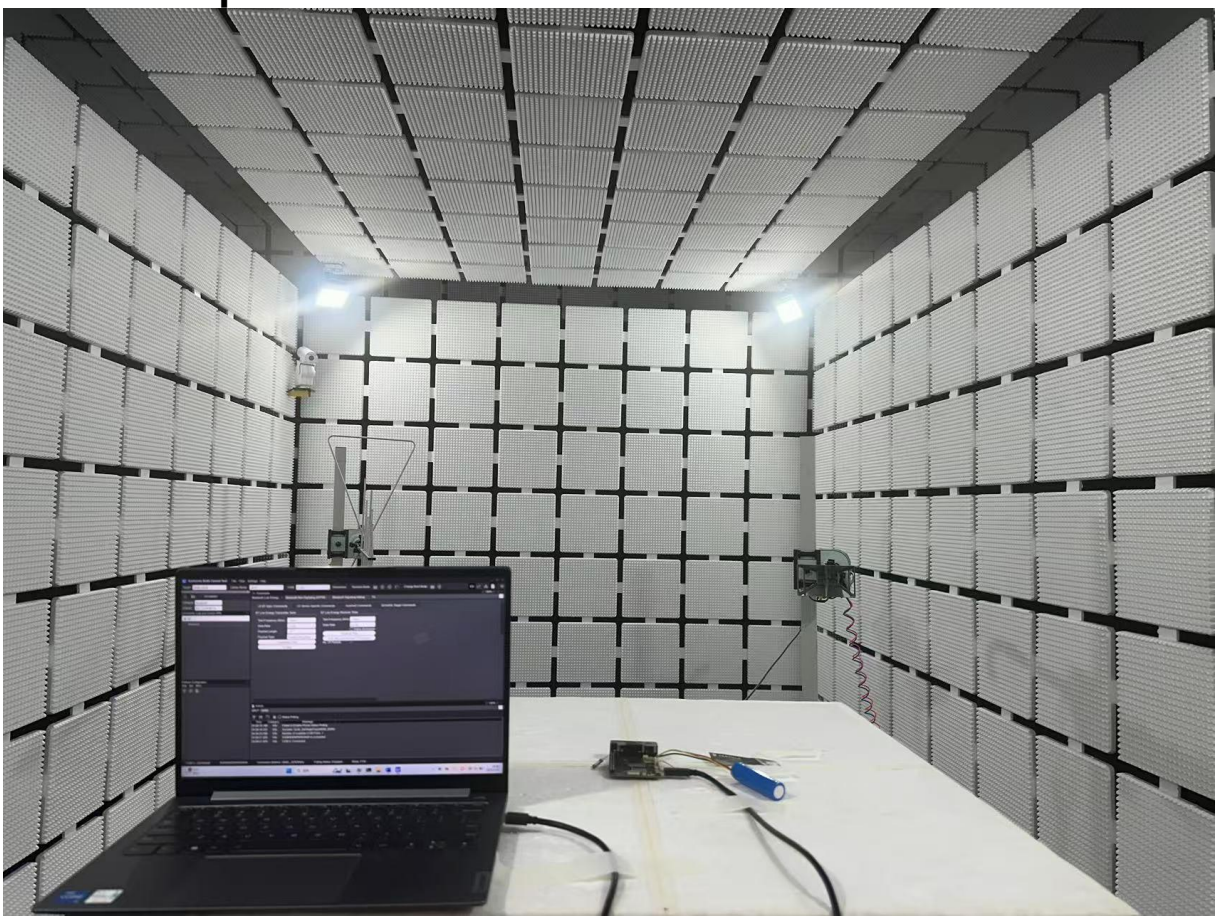
Below 1GHz



Above 1GHz

Test Result:	Appendix

5 Test Setup Photos

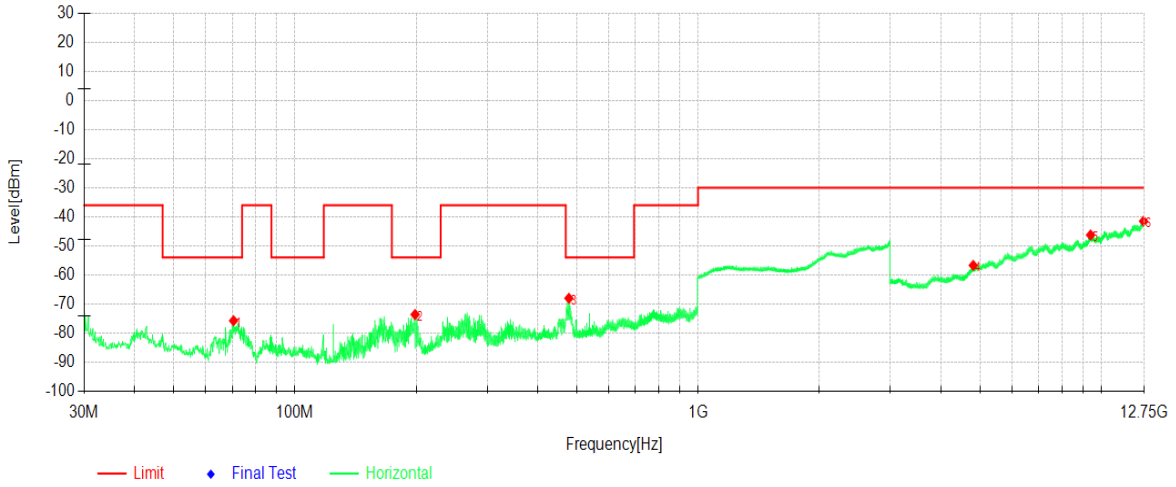


Appendix

Transmitter unwanted emissions in the spurious domain

Project Information			
Mode:	BLE	Band:	-
Bandwidth:	1M	Channel:	Low
IMEI:	863174060029047	Engineer:	Zhang Weizhi
Remark:			

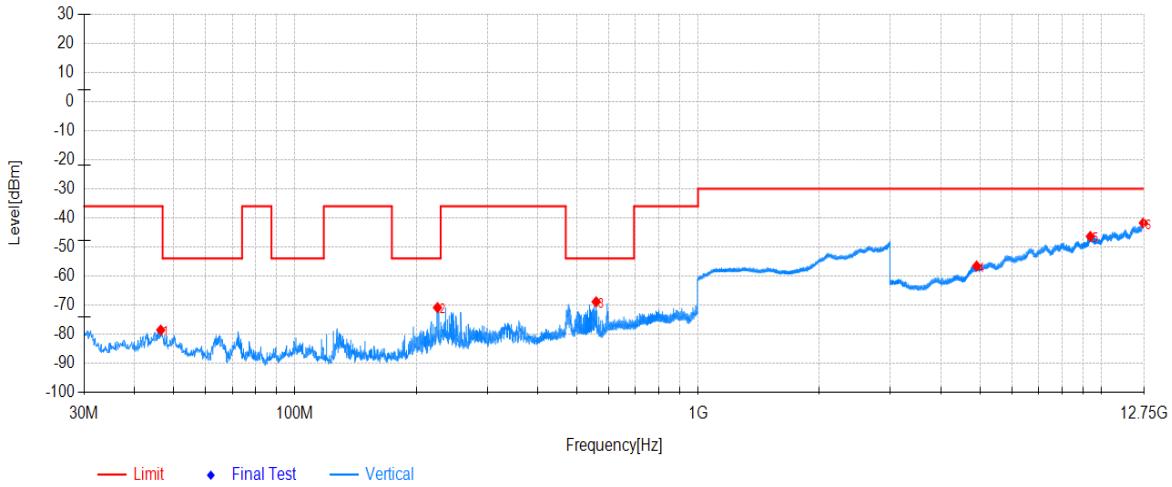
Test Graph



Data List							
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	70.45	-57.73	-75.75	-54.00	21.75	-18.02	Horizontal
2	198.70	-59.55	-73.62	-54.00	19.62	-14.07	Horizontal
3	478.38	-61.89	-68.04	-54.00	14.04	-6.15	Horizontal
4	4815.94	-58.36	-56.72	-30.00	26.72	1.64	Horizontal
5	9410.14	-59.72	-46.26	-30.00	16.26	13.46	Horizontal
6	12734.40	-58.07	-41.52	-30.00	11.52	16.55	Horizontal

Project Information			
Mode:	BLE	Band:	-
Bandwidth:	1M	Channel:	Low
IMEI:	863174060029047	Engineer:	Zhang Weizhi
Remark:			

Test Graph

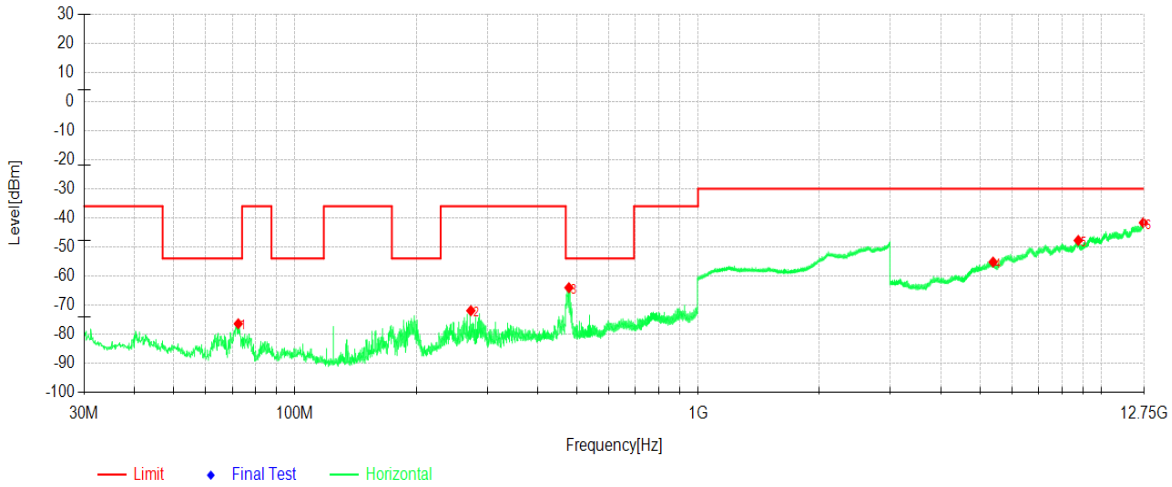


Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	46.49	-67.41	-78.61	-36.00	42.61	-11.20	Vertical
2	225.86	-57.62	-70.90	-54.00	16.90	-13.28	Vertical
3	558.90	-63.90	-68.91	-54.00	14.91	-5.01	Vertical
4	4910.03	-58.87	-56.59	-30.00	26.59	2.28	Vertical
5	9395.51	-59.62	-46.39	-30.00	16.39	13.23	Vertical
6	12726.60	-58.49	-41.77	-30.00	11.77	16.72	Vertical

Project Information			
Mode:	BLE	Band:	-
Bandwidth:	1M	Channel:	High
IMEI:	863174060029047	Engineer:	Zhang Weizhi
Remark:			

Test Graph

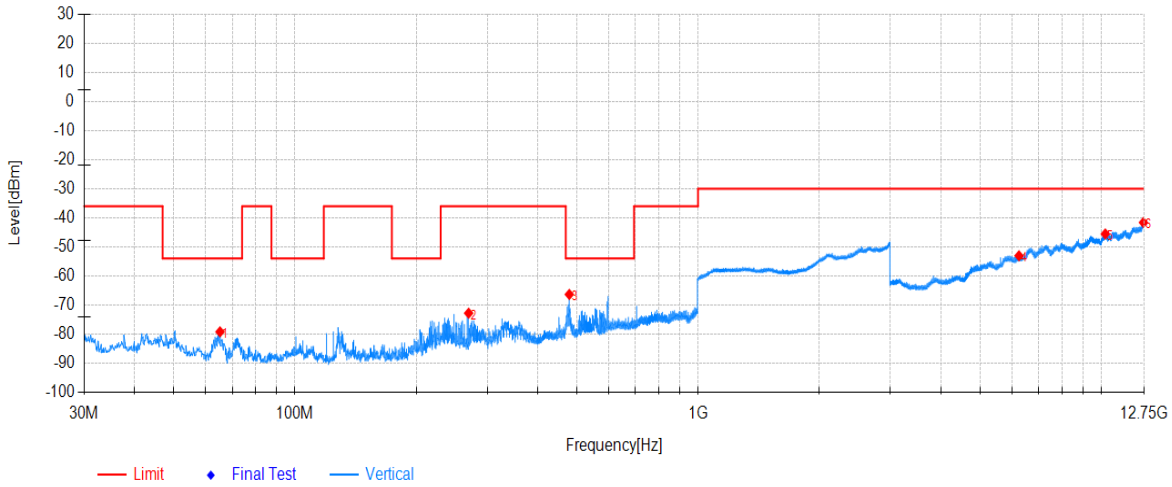


Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	72.39	-57.84	-76.46	-54.00	22.46	-18.62	Horizontal
2	273.20	-61.20	-71.96	-36.00	35.96	-10.76	Horizontal
3	478.38	-57.90	-64.05	-54.00	10.05	-6.15	Horizontal
4	5392.16	-58.40	-55.22	-30.00	25.22	3.18	Horizontal
5	8770.54	-59.72	-47.78	-30.00	17.78	11.94	Horizontal
6	12723.68	-58.19	-41.67	-30.00	11.67	16.52	Horizontal

Project Information			
Mode:	BLE	Band:	-
Bandwidth:	1M	Channel:	High
IMEI:	863174060029047	Engineer:	Zhang Weizhi
Remark:			

Test Graph



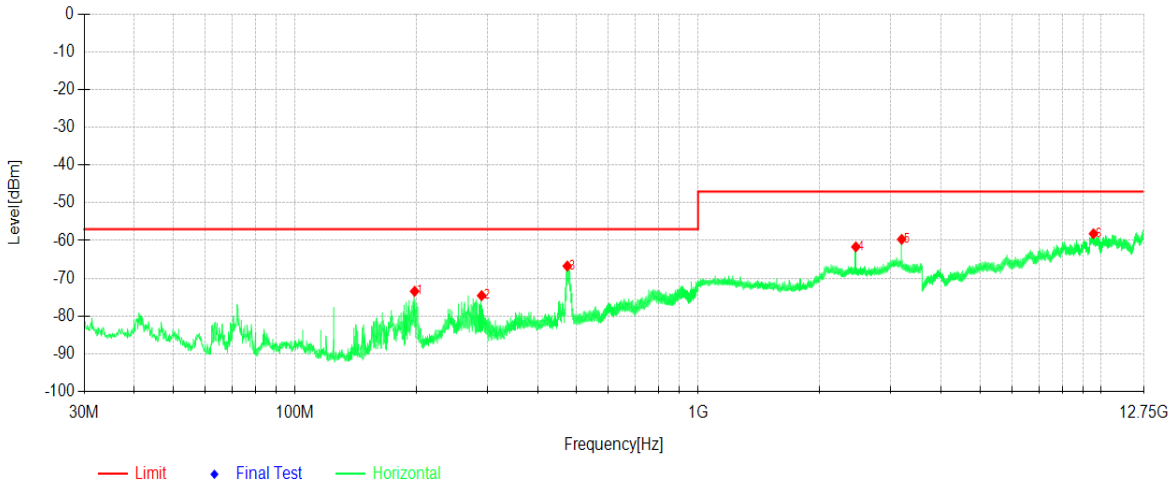
Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	65.21	-62.54	-79.24	-54.00	25.24	-16.70	Vertical
2	269.81	-60.66	-72.82	-36.00	36.82	-12.16	Vertical
3	479.35	-60.34	-66.36	-54.00	12.36	-6.02	Vertical
4	6253.58	-58.35	-53.05	-30.00	23.05	5.30	Vertical
5	10236.45	-59.72	-45.55	-30.00	15.55	14.17	Vertical
6	12725.63	-58.33	-41.61	-30.00	11.61	16.72	Vertical

Receiver spurious emissions (Worst case)

Project Information			
Mode:	BLE	Band:	-
Bandwidth:	1M	Channel:	Low
IMEI:	863174060029047	Engineer:	Zhang Weizhi
Remark:			

Test Graph

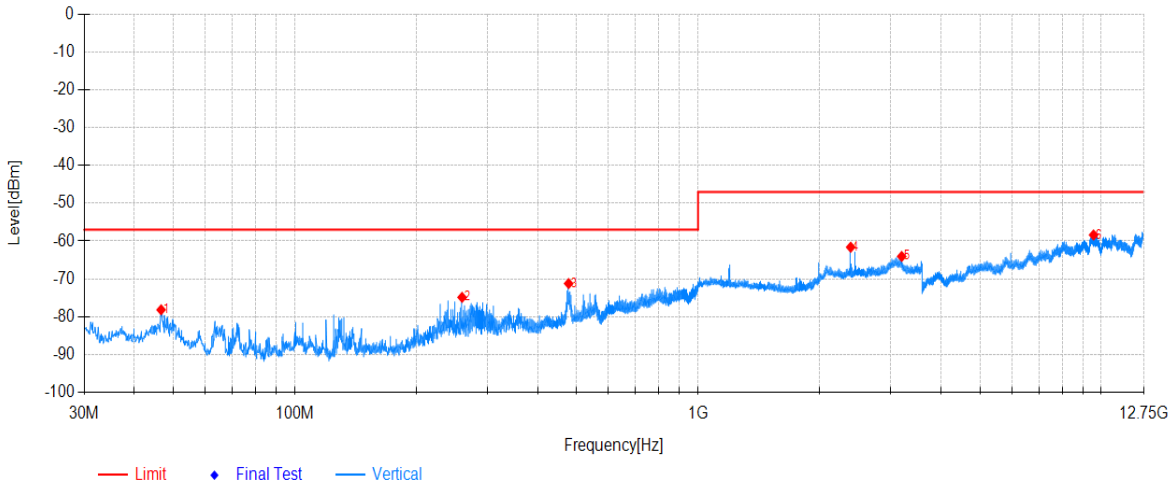


Data List

NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	198.21	-59.34	-73.45	-57.00	16.45	-14.11	Horizontal
2	290.57	-63.59	-74.59	-57.00	17.59	-11.00	Horizontal
3	474.01	-60.59	-66.76	-57.00	9.76	-6.17	Horizontal
4	2462.92	-54.77	-61.68	-47.00	14.68	-6.91	Horizontal
5	3199.67	-56.25	-59.67	-47.00	12.67	-3.42	Horizontal
6	9568.78	-71.38	-58.18	-47.00	11.18	13.20	Horizontal

Project Information			
Mode:	BLE	Band:	-
Bandwidth:	1M	Channel:	Low
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	46.59	-67.00	-78.19	-57.00	21.19	-11.19	Vertical
2	259.91	-63.06	-74.90	-57.00	17.90	-11.84	Vertical
3	477.60	-65.18	-71.25	-57.00	14.25	-6.07	Vertical
4	2391.25	-53.81	-61.62	-47.00	14.62	-7.81	Vertical
5	3200.07	-60.67	-64.07	-47.00	17.07	-3.40	Vertical
6	9572.69	-71.54	-58.39	-47.00	11.39	13.15	Vertical

~The End~