

ISED RF Exposure Test Report

Report No. : SA200520W003
Applicant : Particle Industries, Inc
Address : 126 Post St, 4th floor, San Francisco, CA 94108 USA
Product : Tracker SoM LTE M1
IC : 20127-T40X
Brand : Particle
Model No. : T402M/T404M
Standards : RSS-102 Issue5 / IEEE C95.3-2002
KDB 447498 D01 General RF Exposure Guidance v06
Sample Received Date : May. 20, 2020
Date of Testing : May. 21, 2020 ~ Jul. 02, 2020

CERTIFICATION: The above equipment have been tested by **BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO. LTD.**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by A2LA or any government agencies.

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Release Control Record

Report No.	Reason for Change	Date Issued
SA200520W003	Initial release	Jul. 06, 2020

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1. Description of Equipment Under Test

EUT Type	Tracker SoM LTE M1
IC	20127-T40X
Brand Name	Particle
Model Name	T402M/T404M
Tx Frequency Bands (Unit: MHz)	GSM850 : 824.2 ~ 848.8 GSM1900 : 1850.2 ~ 1909.8 LTE Band 2 : 1850.7 MHz ~ 1909.3 MHz LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 5 : 824.7 MHz ~ 848.3 MHz LTE Band 12 : 699.7 MHz ~ 715.3 MHz LTE Band 13 : 779.5 MHz ~ 784.5 MHz LTE Band 25 : 1850.7 MHz ~ 1914.3 MHz
Uplink Modulations	GSM & GPRS : GMSK EDGE : 8PSK LTE CAT-M1: QPSK, 16QAM
Antenna Type	WWAN: External Antenna
EUT Stage	Identical Prototype

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
2. The schematic and PCB of the two models T402M and T404M used by our company for the certification is completely the same ,and the HW&SW used is the same. Because the product is sold in different market using different models eSIM, different models are named. the differences are as follows:T402M uses eSIM of Kore.T404M uses eSIM of Twilio.

2. MPE(Maximum Permissible Exposure) Assessment

2.1 Introduction

RF exposure evaluation is the method used to evaluate the RF field strength levels generated by a device. RF exposure evaluation is required if the separation distance between the user and the device is greater than 20 cm.

2.2 RF Radiation Exposure Limits

According to RSS 102 Issue 5 March 2015 chapter 2.5.2 as below:

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz⁶ and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

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2.3 MPE Calculation for Standalone Operations

The manufacturer expects that the radiated component of this device will not close to the human body during normal usage and the warning statement was also stated in the user instruction. Since the transmitting antenna will be kept at least 20 cm away from the human body, the MPE level is calculated based on this condition and the result is listed in below table.

GSM

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (W)	Power Density (W/m ²)	Limit (W/m ²)	Power Density / Limit	Result
GSM 850	1.42	33.0	2.767	0.693	2.576	0.269	Pass
GSM 1900	3.77	30.0	2.382	0.597	4.477	0.133	Pass

Note: Concerning 2G has 8 slots, final EIRP shall be 1/8 of the value if using conducted power to calculate.

LTE

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (W)	Power Density (W/m ²)	Limit (W/m ²)	Power Density / Limit	Result
Band 2	3.77	23.5	0.533	1.062	4.477	0.237	Pass
Band 4	3.77	23.0	0.475	0.946	4.243	0.223	Pass
Band 5	1.42	24.0	0.348	0.693	2.577	0.269	Pass
Band 12	1.42	23.0	0.277	0.551	2.303	0.239	Pass
Band 13	1.42	23.0	0.277	0.551	2.480	0.222	Pass
Band 25	3.77	24.5	0.671	1.336	4.477	0.298	Pass

BT/ WIFI

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (W)	Power Density (W/m ²)	Limit (W/m ²)	Power Density / Limit	Result
BT 2.4GHZ	2.0	9.0	0.013	0.025	5.348	0.005	Pass
WIFI 2.4GHZ	2.0	17.0	0.079	0.158	5.366	0.029	Pass

Summary:

Since the ERP (effective radiated power) operated at < 1.5 GHz is less than 1.5 watts and > 1.5 GHz is less than 3 watts, the routine environmental evaluation is not required, and the MPE result calculated for this device complies with the MPE limit as specified in RSS-102 Issue5.

2.4 CONCLUSION OF SIMULTANEOUS TRANSMITTER

Both of the WLAN and WWAN can transmit simultaneously, the formula of calculated the MPE is:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Average EIRP (W)	Power Density (W/m ²)	Power Density / Limit	Σ(Power Density / Limit)	Limit	Result
WWAN	3.77	24.5	0.671	1.336	0.298	0.0327	1.000	PASS
WLAN	2.0	17.0	79.433	0.158	0.029			

CONCLUSION:

Therefore the worst-case situation is, which is less than “1”, this confirmed that the device comply with MPE limit.

3. Information on the Testing Laboratories

We, BV 7LAYERS COMMUNICATIONS TECHNOLOGY (SHENZHEN) CO. LTD., were founded in 2015 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The road map of all our labs can be found in our web site also.

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