ISED RF Exposure Test Report

Report No.	:	**SA200927W002-1**
Applicant	:	**Particle Industries,Inc**
Address	:	**126 Post St,4th floor, San Francisco,CA 94108 USA**
Product	:	**Tracker One LTE M1**
IC	:	**20127-ONE40X**
Brand	:	**Particle**
Model No.	:	**ONE402M, ONE404M, ONE402M-NB, ONE404M-NB**
Standards	:	**RSS-102 Issue5 / IEEE C95.3-2002** **KDB 447498 D01 General RF Exposure Guidance v06**
Sample Received Date	:	**Aug. 07, 2020**
Date of Testing	:	**Aug. 08, 2020 ~ Sept. 10, 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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Jerry Chen / Engineer

Approved By : Luke Lu

Luke Lu / Manager

A2LA ACCREDITED Certificate # 3939.01

Table of Contents

Release Control Record

Report No.	Reason for Change	Date Issued
SA200927W002-1	Initial release	Sept. 14, 2020
SA200927W002-1	Based on the original report SA200927W002-1 add circuit, change HW version and add two models ONE402M-NB, ONE404M-NB. In this report, all the test data are copied from the original report.	Oct. 29, 2020

1. Description of Equipment Under Test

EUT Type	Tracker ONE LTE M1
IC	20127-ONE40X
Brand Name	Particle
Model Name	ONE402M, ONE404M, ONE402M-NB, ONE404M-NB
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 WLAN : 2412 ~ 2462 MHz Bluetooth : 2402 ~ 2480 MHz GPS/ GLONASS/ BDS/ GALILEO: 1559MHz ~ 1610MHz NFC : 13.56 MHz
Uplink Modulations	GPRS : GMSK EDGE : 8PSK LTE : QPSK, 16QAM 802.11b : DSSS 802.11g/n : OFDM Bluetooth : GFSK, π/4-DQPSK, 8-DPSK NFC : ASK GPS/ GLONASS / BDS/ GALILEO: BPSK
Antenna Type	WLAN: FPCB Antenna WWAN: External Antenna
EUT Stage	Production Unit

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. 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

The electronic and electro-technical apparatus shall comply with the basic restriction as specified in IC RSS-102. A summary of the reference levels is given in below table.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003 – 10	83	90	-	6
0.1 – 10	-	0.73/f	-	6
1.1 – 10	$87/f^{0.5}$	-	-	6
10 – 20	27.46	0.0728	2	6
20 – 48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48 – 300	22.06	0.05852	1.291	6
300 – 6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619\ f^{0.6834}$	6
6000 – 15000	61.4	0.163	10	6
15000 – 150000	61.4	0.163	10	$616000/f^{1.2}$
150000 – 300000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000/f^{1.2}$

RF Field Strength Limits for Devices Used by the General Public

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003 – 10	170	180	-	6
0.1 – 10	-	1.6/f	-	6
1.29 – 10	$193/f^{0.5}$	-	-	6
10 – 20	61.4	0.163	10	6
20 – 48	$129.8/f^{0.25}$	$0.3444/f^{0.25}$	$44.72/f^{0.5}$	6
48 – 100	49.33	0.1309	6.455	6
100 – 6000	$15.60\ f^{0.25}$	$0.04138\ f^{0.25}$	$0.6455f^{0.5}$	6
6000 – 15000	137	0.364	50	6
15000 – 150000	137	0.364	50	$616000/f^{1.2}$
150000 – 300000	$0.354\ f^{0.5}$	$9.40 \times 10^{-4}\ f^{0.5}$	$3.33 \times 10^{-4}\ f$	$616000/f^{1.2}$

RF Field Strength Limits for Controlled Use Devices

Notes:

1. f = frequency in MHz

2.3 MPE Assessment Method

Calculations can be made to predict RF field strength and power density levels around typical RF sources. For example, in the case of a single radiating antenna, a prediction for power density in the far-field of the antenna can be made by use of the general Equations below. This equation is generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction.

$$\text{Power Density (S)} = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

Where
S = Power Density, unit in W/m^2
P = Power input to the antenna, unit in Watts
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = Distance to the center of radiation of the antenna, unit in meter
EIRP = Effective isotropically radiated power

2.4 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.

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	1.98	33.0	3.148	0.789	2.576	0.306	PASS
GSM 1900	2.27	30.0	1.687	0.423	4.477	0.094	PASS
.LTE BAND 2	2.27	23.5	0.378	0.752	4.477	0.168	PASS
LTE BAND 4	1.94	23.0	0.312	0.621	4.243	0.146	PASS
LTE BAND 5	1.98	24.0	0.396	0.789	2.577	0.306	PASS
LTE BAND 12	1.98	23.0	0.315	0.627	2.303	0.272	PASS
LTE BAND 13	1.98	23.0	0.315	0.627	2.480	0.253	PASS
LTE BAND 25	2.27	24.5	0.475	0.946	4.477	0.211	PASS
BLUETOOTH	1.71	9.0	0.012	0.023	5.351	0.004	PASS
WIFI 2.4G	1.71	17.0	0.074	0.048	5.366	0.009	PASS

2.5 CONCLUSION OF SIMULTANEOUS TRANSMITTER

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

CPD1/LPD1+CPD2/LPD2+……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	1.98	33.0	3.148	0.789	0.306	0.315	1.000	PASS
WLAN	1.71	17.0	0.074	0.048	0.009			

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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