VARIANT ISED RF Exposure Test Report

Report No.	:	**W7L-P23030011SA02**
Applicant	:	**Particle Industries,Inc**
Address	:	**325 9th Street, San Francisco, CA 94103, United States Of America**
Product	:	**E Series Module**
IC	:	**20127-E404X**
Brand	:	**Particle**
Model No.	:	**E404X**
Standards	:	**RSS-102 Issue5 / IEEE C95.3-2002** **KDB 447498 D01 General RF Exposure Guidance v06**
Sample Received Date	:	**Mar. 10, 2023**
Date of Testing	:	**Mar. 10, 2023 ~ Mar. 24, 2023**

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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Approved By : Luke Lu / Manager

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Release Control Record

Report No.	Reason for Change	Date Issued
W7L-P22110028SA02	Initial release	Dec. 08, 2022
W7L-P23030011SA02	Based on the original product change components and hardware version, it doesn't affect Power Function, The new sample no change data.	Mar. 24, 2023

1. Description of Equipment Under Test

EUT Type	E Series Module
IC	20127-E404X
Brand Name	Particle
Model Name	E404X
Tx Frequency Bands (Unit: MHz)	BLE : 2402MHz ~ 2480MHz 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
Uplink Modulations	BLE : GFSK LTE : QPSK, 16QAM
Antenna Type	WWAN: External Antenna(KIT) / External Antenna(Taoglas) BLE: External Antenna(PARTICLE)
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.

NOTE: Please refer to the original report W7L-P22110028EM02, IC: 20127-E404X.

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

NOTE: Please refer to the original report W7L-P22110028EM02, IC: 20127-E404X.

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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