RF EXPOSURE REPORT

Applicant:	Particle Industries, Inc
Address:	126 Post St,4th floor, San Francisco, CA 94108 USA

Manufacturer or Supplier:	Particle Industries, Inc
Address:	126 Post St,4th floor, San Francisco, CA 94108 USA
Product:	E Series LTE
Brand Name:	Particle
Model Name:	E402, E404
IC ID:	8585A-2AGQN4NNN
Date of tests:	Oct. 17, 2019 ~ Dec. 05, 2019

The submitted sample of the above equipment has been tested for according to the requirements of the following standards:

☒ **RSS-102 Issue 5 (March, 2015)**
☒ IEEE C95.3

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Remark：This test report is for internal customer use only, not as a final certification test report.

Prepared by Alex Chen Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
Alex Date: Dec. 23, 2020	Luke Lu Date: Dec. 23, 2020

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
SA191017W005	Original release, This test report is for internal customer use only, not as a final certification test report.	Dec. 09, 2019
SAP20120028	Based on the original product add one model name. In this report, All test data is copied from the original test report SA191017W005.	Dec. 23, 2020

1 GENERAL DESCRIPTION OF EUT

EUT	E Series LTE	
BRAND NAME	Particle	
MODEL NAME	E402, E404	
POWER SUPPLY	DC 5V	
OPERATING TEMPERATURE RANGE	-20 ~ 60℃	
MODULATION TYPE	**LTE**	QPSK
OPERATING FREQUENCY	**LTE**	1850.7MHz ~ 1909.3MHz (FOR LTE Band2) 1710.7MHz ~ 1754.3MHz (FOR LTE Band4) 824.7MHz ~ 848.3MHz (FOR LTE Band5) 699.7MHz ~ 715.3MHz (FOR LTE Band12)
ANTENNA GAIN	**LTE Band 2**	Fixed External Antenna with 3.77dBi gain
	LTE Band 4	Fixed External Antenna with 3.77dBi gain
	LTE Band 5	Fixed External Antenna with 1.42dBi gain
	LTE Band 12	Fixed External Antenna with 1.4dBi gain
HW VERSION	V1.00	
SW VERSION	V1.4.0	
I/O PORTS	Refer to user's manual	
CABLE SUPPLIED	N/A	

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The schematic and PCB of the E404 is completely the same with E402, and these two models of HW&SW is the same. Because changing the MVNO's E-SIM card（embedded SIM card）provider from Kore to Twilio, so we plan to use different model name to sell it in market. The differences are as follows:E402 uses eSIM of Kore.E404 uses eSIM of Twilio.
3. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

2 RF EXPOSURE

2.1 EXEMPTION LIMITS FOR ROUTINE EVALUATION – RF EXPOSURE EVALUATION

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 MHz[Footnote6] 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 $22.48/f^{0.5}$ 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

2.2 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
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	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
* Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

2.3 MPE CALCULATION FORMULA

$Pd = (Pout*G) / (4*Pi*R^2)$

where

Pd = power density in W/m^2

Pout = output power to antenna in W

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in m

2.4 CLASSIFICATION

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. The antenna of this equipment, under normal use condition, is at least 20cm away from the body of the user. The limit is designed to provide reasonable protection against harmful interference in a residential installation.

2.5 CALCULATION RESULT OF RF EXPOSURER

LTE

Band	Frequency (MHz)	Operating Mode	Antenna Gain (dBi)	Tune-up Power (dBm)	Tune-up Power (W)	Exemption Limit (W)	Evaluation Result
Band2	1850-1910	QPSK	3.77	23.00	0.9456	2.24	N/A
Band4	1710-1755	QPSK	3.77	23.00	0.9456	2.12	N/A
Band5	824-849	QPSK	1.42	23.50	0.6148	1.29	N/A
Band12	699-716	QPSK	1.4	24.00	0.3153	1.15	N/A

Remark: The “N/A” means that, according to the result, LTE Band 2/LTE Band 4/LTE Band 5/LTE Band 12 Max. e.i.r.p. is less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (when f is in MHz), so it is exempt from RF Exposure Evaluation.