RADIO TEST REPORT

(EN 62311)

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:	Tracker One LTE CAT1/3G/2G
Brand Name:	Particle
Model Name:	ONE523M, ONE524M, ONE523M-NB, ONE524M-NB
Date of tests:	Oct. 10, 2020 ~ Oct. 28, 2020

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

☒ **EN 62311: 2020**

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

Prepared by Alex Chen Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
Alex Date: Oct. 28, 2020	Luke Lu Date: Oct. 28, 2020

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
SE201009W001	Original release	Oct. 28, 2020

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1 GENERAL INFORMATION

PRODUCT	Tracker One LTE CAT1/3G/2G	
BRAND NAME	Particle	
MODEL NAME	ONE523M, ONE524M, ONE523M-NB, ONE524M-NB	
NOMINAL VOLTAGE	LI+ pin：DC+3.6v--4.2V or Vusb PIN： DC+4.5V--5.5V or Vin PIN： DC 6V--30V	
MODULATION TYPE	**WLAN**	DSSS, OFDM
	BT_LE	GFSK
	Bluetooth	GFSK, π/4-DQPSK, 8DPSK
	GPS/ GLONASS / BDS/ GALILEO	BPSK
	NFC	ASK/FSK
	GSM/GPRS/EDGE	GMSK, 8PSK
	WCDMA	BPSK/QPSK
	LTE	QPSK/16QAM
OPERATING FREQUENCY	**WLAN**	2412 ~ 2472MHz for 11b/g/n(HT20/HT40)
	Bluetooth/BT_LE	2402MHz ~ 2480MHz
	GPS/ GLONASS/ BDS/ GALILEO	1559MHz ~ 1610MHz
	NFC	13.56MHz
	GSM	880.2MHz ~ 914.8MHz (FOR GSM 900) 1710.2MHz ~ 1784.8MHz (FOR DCS 1800)
	WCDMA	1922.6MHz~ 1977.4MHz (FOR WCDMA Band 1) 882.4MHZ ~ 912.6MHz (FOR WCDMA Band 8)
	LTE	1922.5MHz~ 1977.5MHz (FOR LTE Band1) 1710.7MHz ~ 1784.3MHz (FOR LTE Band3) 2502.5MHz~ 2567.5MHz (FOR LTE Band7) 880.7MHz ~ 914.3MHz (FOR LTE Band8) 834.5MHz~ 859.5MHz (FOR LTE Band20) 704.5MHz ~ 746.5MHz (FOR LTE Band28)

MAX. ANTENNA GAIN	GSM 900: 1.98dBi PCS 1800: 1.94dBi WCDMA Band I : 2.27dBi WCDMA Band VIII : 1.98dBi LTE Band 1 : 2.27dBi LTE Band 3 : 1.94dBi LTE Band 7 : 2.14dBi LTE Band 8 : 1.98dBi LTE Band 20 : 1.98dBi LTE Band 28：1.98dBi
HW VERSION	V1.0 Product HW Version：V1.0 V1.1 Product HW Version：V1.1
SW VERSION	V1.5.4
I/O PORTS	Refer to user's manual
CABLE SUPPLIED	USB cable: non-shielded, detachable, 2.0meter

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. The difference of V1.0 and V1.1 is V1.1 update PCBA and add some components, which not affect RF function. At the same time, we add three product models on v1.1, ONE524M, ONE523M-NB, ONE524M-NB, please see the table below for the differences of different model.

Product name	e-SIM company	Built-in LiPo battery
ONE523M	Kore	Yes
ONE524M	Twilio	Yes
ONE523M-NB	Kore	No
ONE524M-NB	Twilio	No

3. The EUT was powered by the following Battery:

BATTERY	
BRAND:	Zhaoneng
MODEL:	113450
MANUFACTURER	Zhaoneng Battery Industrial Co., Ltd
POWER RATING:	3.7V, 2000mAh

4. The EUT matched the following USB cable:

USB CABLE	
BRAND:	KAWEEI
MODEL:	CBUSB31-AM-CM-2000
SIGNAL LINE:	2.0 METER

5. 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 MEASUREMENT

2.1 INTRODUCTION

This International Standard applies to electronic and electrical equipment for which no dedicated product- or product family standard regarding human exposure to electromagnetic fields applies.

The frequency range covered is 0 Hz to 300 GHz.

The object of this generic standard is to provide assessment methods and criteria to evaluate such equipment against basic restrictions or reference levels on exposure of the general public related to electric, magnetic and electromagnetic fields and induced and contact current.

2.2 LIMIT

According to EN 62311: 2020, the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation.

FREQUENCY RANGE	E-FIELD STRENGTH (V/m)
400 ~ 2000MHz	$1.375*F^{1/2}$
2 ~ 300GHz	61

Note: F= Operating frequency

3.3 CLASSIFICATION OF THE ASSESSMENT METHODS

The antenna of the product, under normal use condition is at least 20 cm away from the body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the WLAN easy install sheet. So, this product under normal use is located on electromagnetic far field between the human body.

Far Field Calculation Formula

$$E = \eta_0 H = \frac{\sqrt{30PG(\theta,\phi)}}{r}$$

G = antenna gain relative to an isotropic antenna
θ,ϕ = elevation and azimuth angles to point of investigation
r = distance from observation point to the antenna
η_0 = Characteristic impedance of free space

3.4 TEST RESULTS

CALCULATION FOR MAXIMUM E.I.R.P.

GSM

OPERATING BAND(MHz)	Frequency (MHz)	Antenna Gain (dBi)	Tune-up Conducted Time Average Power (dBm)	Tune-up Power (W)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS / FAIL
GSM 900	880.2	1.98	23.50	0.028	5.76	40.79	PASS
DCS 1800	1710.2	1.94	20.50	0.014	4.05	56.86	PASS

WCDMA

OPERATING BAND(MHz)	Frequency (MHz)	Antenna Gain (dBi)	Tune-up Power (dBm)	Tune-up Power (W)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS / FAIL
WCDMA B1	1922.6	2.27	23.50	0.224	16.83	60.29	PASS
WCDMA B8	882.4	1.98	23.50	0.224	16.28	40.84	PASS

LTE

OPERATING BAND(MHz)	Frequency (MHz)	Antenna Gain (dBi)	Tune-up Power (dBm)	Tune-up Power (W)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS / FAIL
Band 1	1922.5	2.27	24.00	0.251	17.82	60.29	PASS
Band 3	1710.7	1.94	23.50	0.224	16.21	56.87	PASS
Band 7	2502.5	2.14	23.50	0.224	16.58	61.00	PASS
Band 8	880.7	1.98	24.00	0.251	17.23	40.81	PASS
Band 20	834.5	1.98	23.50	0.224	16.28	39.72	PASS
Band 28	704.5	1.98	23.50	0.224	16.28	36.50	PASS

BT

OPERATING BAND(MHz)	Frequency (MHz)	Antenna Gain (dBi)	Tune-up Power (dBm)	Tune-up Power (W)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS / FAIL
BLUETOORH	2402	1.71	17.5	0.056	7.89	61.00	PASS

WIFI 2.4G

OPERATING BAND(MHz)	Frequency (MHz)	Antenna Gain (dBi)	Tune-up Power (dBm)	Tune-up Power (W)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS / FAIL
WIFI 2.4G	2412	1.71	16.5	0.045	7.07	61.00	PASS

COLLOCATED EXPOSURE FIELD STRENGTHS CALCULATION

Band	Frequency (MHz)	(E-Field Strength)^2/ (Limit)^2	Σ((E-Field Strength)^2/ (Limit)^2) of WWAN+WLAN	PASS / FAIL
Band 1	1922.5	0.087	0.104	PASS
BLUETOOTH	2402	0.017		

Note:

1. For collocation analysis, LTE Band 1 is chosen for summation due to the highest(E-Field Strength) among all WWAN Band;
2. Simultaneous Transmitter requirements： Σ((E-Field Strength)^2/ (Limit)^2)$\leqslant$1

CONCLUSION :

According to Council Recommendation 1999/519/EC and RED (Directive2014/53/EU), the RF exposure analysis concludes that the RF Exposure is CE compliant.