VARIANT RADIO TEST REPORT

(EN IEC 62311)

Applicant:	Particle Industries,Inc
Address:	325 9th St, San Francisco, CA 94103 USA,415-319-1553

Manufacturer or Supplier:	Particle Industries,Inc
Address:	325 9th St, San Francisco, CA 94103 USA,415-319-1553
Product:	Tracker SoM LTE CAT1/3G/2G
Brand Name:	Particle
Model Name:	T523M/T524M
Date of tests:	May. 21, 2020 ~ Jun. 16, 2021

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

☒ **EN IEC 62311: 2020**

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

Prepared by Simon Wang Engineer / Mobile Department	Approved by Luke Lu Manager / Mobile Department
Simon Wang Date: Aug. 17, 2022	Luke Lu Date: Aug. 17, 2022

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
SE200520W002	Original release	Jul. 01, 2020
SEBVCZ-W7L-P21060023	Based on the original SE200520W002 Update the standard	Jun. 17, 2021
W7L-P22080017SA01	Based on the original report SEBVCZ-W7L-P21060023 change the address, all the data is copied from the origin report.	Aug. 17, 2022

1 GENERAL INFORMATION

PRODUCT	Tracker SoM LTE CAT1/3G/2G	
BRAND NAME	Particle	
MODEL NAME	T523M/T524M	
NOMINAL VOLTAGE	Li+ PIN: DC +3.3V--4.3V or Vusb PIN: DC +4.35V--5.5V or Vin PIN: DC +3.9V--17V	
MODULATION TYPE	**GSM/GPRS/EDGE**	GMSK, 8PSK
	WCDMA	BPSK/QPSK/16QAM
	LTE CAT.1	QPSK/16QAM
PERATING FREQUENCY	**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)
ANTENNA TYPE	External Antenna	
Max. ANTENNA GAIN	**GSM**	1.42dBi for GSM 900
		3.77dBi for DCS 1800
	WCDMA	3.77dBi for WCDMA Band 1
		1.42dBi for WCDMA Band 8
	LTE	3.77dBi for LTE Band1 3.77dBi for LTE Band3 4.66dBi for LTE Band7 1.42dBi for LTE Band8 1.42dBi for LTE Band20 1.42dBi for LTE Band28
HW VERSION	V1.0	
SW VERSION	V1.5.4	
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 two models T523M and T524M 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:T523M uses eSIM of Kore.T524M 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 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 IEC 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 Conducted Power (W)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS / FAIL
GSM 900	880.2 ~ 914.8	1.42	23.5	0.224	15.26	40.79	PASS
DCS 1800	1710.2 ~ 1784.8	3.77	20.5	0.112	14.15	56.86	PASS

WCDMA

OPERATING BAND(MHz)	Frequency (MHz)	Antenna Gain (dBi)	Tune-up Conducted Power (dBm)	Tune-up Conducted Power (W)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS / FAIL
Band 1	1922.6~ 1977.4	3.77	23.5	0.224	20.01	60.29	PASS
Band 8	882.4 ~ 912.6	1.42	23.5	0.224	15.26	40.84	PASS

LTE

OPERATING BAND(MHz)	Frequency (MHz)	Antenna Gain (dBi)	Tune-up Conducted Power (dBm)	Tune-up Conducted Power (W)	E-Field Strength (V/m)	E-Field Strength Limit (V/m)	PASS / FAIL
Band 1	1922.5~ 1977.5	3.77	24.0	0.251	21.18	60.29	PASS
Band 3	1710.7 ~ 1784.3	3.77	23.5	0.224	20.01	56.87	PASS
Band 7	2502.5~ 2567.5	4.66	23.5	0.224	22.16	61.0	PASS
Band 8	880.7 ~ 914.3	1.42	24.0	0.251	16.16	40.81	PASS
Band 20	834.5~ 859.5	1.42	23.5	0.224	15.26	39.72	PASS
Band 28	704.5 ~ 746.5	1.42	23.5	0.224	15.26	36.5	PASS

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.