





# 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	Boron 2G/3G
Brand Name	Particle
Model	BRN310
Additional Model & Model Difference	BRN314
Date of tests	Sep. 03, 2018 ~ Nov. 08, 2018

- IC RSS-102 Issue 5
- IEEE C95.3

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

Tested by Breeze Jiang Senior Project Engineer / EMC Department	Approved by Glyn He Assistant Manager / EMC Department
	
	Date: Dec. 28, 2020

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
IM180831N010	Original release	Dec. 10, 2018
IM2012WDG0026	Based on the original report IM180831N010 changed the brand name and added the additional model, but it doesn't need to be retested.	Dec. 28, 2020



## 1. CERTIFICATION

<b>IC:</b>	20127-BRN310
<b>PRODUCT:</b>	Boron 2G/3G
<b>BRAND NAME:</b>	Particle
<b>MODEL NO.:</b>	BRN310
<b>ADDITIONAL NO.:</b>	BRN314
<b>TEST SAMPLE:</b>	Engineering Sample
<b>APPLICANT:</b>	Particle Industries, Inc
<b>STANDARDS:</b>	IC RSS-102 Issue 5
	IEEE C95.3

Note: Additional model BRN314 is identical with the test model BRN310 except the model name for trading purpose.



## 2. RF EXPOSURE LIMIT

### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

FREQUENCY RANGE (MHz)	ELECTRIC FIELD STRENGTH (V/m)	MAGNETIC FIELD STRENGTH (A/m)	POWER DENSITY (W/m <sup>2</sup> )	AVERAGE TIME (minutes)
<b>LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE</b>				
48-300	22.06	0.05852	1.291	6
300-6000	3.142*F <sup>0.3417</sup>	0.008335*F <sup>0.3417</sup>	0.02619*F <sup>0.6834</sup>	6

F = Frequency in MHz

## 3. MPE CALCULATION FORMULA

$$Pd = (Pout * G) / (4 * pi * r^2)$$

where

Pd = power density in W/m<sup>2</sup>

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

## 4. CLASSIFICATION

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.



## 5. ANTENNA GAIN

<u>Technology/Band</u>	<u>Mode</u>	<u>Target Power and Tolerance (dBm)</u>
GSM 850	GSM (GMSK, 1Tx-slot)	32±1.0 dBm
	GPRS (GMSK, 1Tx-slot)	32±1.0 dBm
	GPRS (GMSK, 2Tx-slot)	31±1.0 dBm
	GPRS (GMSK, 3Tx-slot)	29±1.0 dBm
	GPRS (GMSK, 4Tx-slot)	28±1.0 dBm
	EDGE (8PSK, 1Tx-slot)	26±1.0 dBm
	EDGE (8PSK, 2Tx-slot)	23±1.0 dBm
	EDGE (8PSK, 3Tx-slot)	22±1.0 dBm
	EDGE (8PSK, 4Tx-slot)	20±1.0 dBm
GSM 1900	GSM (GMSK, 1Tx-slot)	29±1.0 dBm
	GPRS (GMSK, 1Tx-slot)	29±1.0 dBm
	GPRS (GMSK, 2Tx-slot)	28±1.0 dBm
	GPRS (GMSK, 3Tx-slot)	26±1.0 dBm
	GPRS (GMSK, 4Tx-slot)	25±1.0 dBm
	EDGE (8PSK, 1Tx-slot)	25±1.0 dBm
	EDGE (8PSK, 2Tx-slot)	23±1.0 dBm
	EDGE (8PSK, 3Tx-slot)	21±1.0 dBm
	EDGE (8PSK, 4Tx-slot)	19±1.0 dBm
WCDMA Band II	RMC 12.2K	21±1.0 dBm
WCDMA Band V	RMC 12.2K	22±1.0 dBm
DSSS(802.15.4)	OQPSK	-1±1.0 dBm



## 6. CALCULATION RESULT OF MAXIMUM CONDUCTED POWER

Band	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (W/m <sup>2</sup> )	Limit (W/m <sup>2</sup> )	Power Density / Limit
GSM 850 (1 Tx slot)	1.0	33.0	34.000	2.512	316.228	0.629	2.576	0.244
GPRS 850 (1 Tx slot)	1.0	33.0	34.000	2.512	316.228	0.629	2.576	0.244
GPRS 850 (2 Tx slots)	1.0	32.0	33.000	1.995	501.187	0.998	2.576	0.387
GPRS 850 (3 Tx slots)	1.0	30.0	31.000	1.259	472.063	0.940	2.576	0.365
GPRS 850 (4 Tx slots)	1.0	29.0	30.000	1.000	501.187	0.998	2.576	0.387
EGPRS 850 (1 Tx slot)	1.0	27.0	28.000	0.631	79.433	0.158	2.576	0.061
EGPRS 850 (2 Tx slots)	1.0	24.0	25.000	0.316	79.433	0.158	2.576	0.061
EGPRS 850 (3 Tx slots)	1.0	23.0	24.000	0.251	94.189	0.187	2.576	0.073
EGPRS 850 (4 Tx slots)	1.0	21.0	22.000	0.158	79.433	0.158	2.576	0.061
GSM 1900 (1 Tx slot)	3.5	30.0	33.500	2.239	281.838	0.561	4.477	0.125
GPRS 1900 (1 Tx slot)	3.5	30.0	33.500	2.239	281.838	0.561	4.477	0.125
GPRS 1900 (2 Tx slots)	3.5	29.0	32.500	1.778	446.684	0.889	4.477	0.199
GPRS 1900 (3 Tx slots)	3.5	27.0	30.500	1.122	420.727	0.837	4.477	0.187
GPRS 1900 (4 Tx slots)	3.5	26.0	29.500	0.891	446.684	0.889	4.477	0.199
EGPRS 1900 (1 Tx slot)	3.5	26.0	29.500	0.891	112.202	0.223	4.477	0.050
EGPRS 1900 (2 Tx slots)	3.5	24.0	27.500	0.562	141.254	0.281	4.477	0.063
EGPRS 1900 (3 Tx slots)	3.5	22.0	25.500	0.355	133.045	0.265	4.477	0.059
EGPRS 1900 (4 Tx slots)	3.5	20.0	23.500	0.224	112.202	0.223	4.477	0.050
WCDMA Band 5	1.0	23.0	24.000	0.251	251.189	0.500	2.581	0.194
WCDMA Band 2	3.5	22.0	25.500	0.355	354.813	0.706	4.480	0.158
DSSS(802.15.4)	0	0	0	0.001	-	0.00199	5.366	0.00037

## 7. CONCLUSION OF SIMULTANEOUS TRANSMITTER

Both of the WLAN and plug-in device 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



**BUREAU**  
**VERITAS**

**Test Report No.: IM2012WDG0026**

Therefore the worst-case situation is  $0.387+0.00037 = 0.38737$ , which is less than “1”,  
This confirmed that the device comply with the MPE limit.

**--- END ---**