



# RF EXPOSURE REPORT

Applicant	Particle Industries, Inc
Address	325 9th Street, San Francisco, CA 94103 United States

Manufacturer or Supplier	Particle Industries, Inc
Address	325 9th Street, San Francisco, CA 94103 United States
Product	Wi-Fi Module
Brand Name	Particle
Model	P2
Additional Model & Model Difference	N/A
Date of tests	Feb. 21, 2021 ~ Apr. 11, 2022

- ☒ FCC Part 2 (Section 2.1091)
- ☒ KDB 447498 D01
- ☒ IEEE C95.1

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

Tested by Lucas Chen Project Engineer / EMC Department	Approved by Glyn He Assistant Manager / EMC Department
	
	Date: May 19, 2022

This report is governed by, and incorporates by reference, CPS Conditions of Service as posted at the date of issuance of this report at <https://www.cps.bureauveritas.com/terms-conditions> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.

## TABLE OF CONTENTS

RELEASE CONTROL RECORD .....	3
1. CERTIFICATION.....	4
2. RF EXPOSURE LIMIT .....	5
3. MPE CALCULATION FORMULA.....	5
4. CLASSIFICATION .....	5
5. ANTENNA GAIN .....	6
6. CALCULATION RESULT OF MAXIMUM CONDUCTED POWER.....	7



Test Report No.: FM2202WDG0092

## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FM2202WDG0092	Original release	May 19, 2022

## 1. CERTIFICATION

<b>PRODUCT:</b>	Wi-Fi Module
<b>BRAND NAME:</b>	Particle
<b>MODEL NO.:</b>	P2
<b>ADDITIONAL MODEL:</b>	N/A
<b>FCC ID:</b>	2AEMI-P2
<b>TEST SAMPLE:</b>	ENGINEERING SAMPLE
<b>APPLICANT:</b>	Particle Industries, Inc
<b>STANDARDS:</b>	FCC Part 2 (Section 2.1091)
	KDB 447498 D01
	IEEE C95.1

## 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 (mW/cm <sup>2</sup> )	AVERAGE TIME (minutes)
LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE				
300-1500	...	...	F/1500	30
1500-100,000	...	...	1.0	30

F = Frequency in MHz

## 3. MPE CALCULATION FORMULA

$$P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$$

where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

G = gain of antenna in linear scale

$\pi$  = 3.1416

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

## 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

The antennas provided to the EUT, please refer to the following table:

Frequency Band	Antenna Gain (dBi)	Antenna Type
BT 2.4GHz	2.41	PCB Antenna
Wi-Fi 2.4GHz	2.41	PCB Antenna
Wi-Fi 5GHz (5150-5250MHz)	1.28	PCB Antenna
Wi-Fi 5GHz (5250-5350MHz)	1.60	PCB Antenna
Wi-Fi 5GHz (5500-5725MHz)	1.74	PCB Antenna
Wi-Fi 5GHz (5725-5850MHz)	1.21	PCB Antenna

Frequency Band	Antenna Gain (dBi)	Antenna Type
BT 2.4GHz	1.55	External PCB Antenna
Wi-Fi 2.4GHz	1.55	External PCB Antenna
Wi-Fi 5GHz (5150-5250MHz)	-0.32	External PCB Antenna
Wi-Fi 5GHz (5250-5350MHz)	-0.08	External PCB Antenna
Wi-Fi 5GHz (5500-5725MHz)	0.87	External PCB Antenna
Wi-Fi 5GHz (5725-5850MHz)	1.26	External PCB Antenna

## 6. CALCULATION RESULT OF MAXIMUM CONDUCTED POWER

The tuned conducted Average Power (declared by client)

Mode	Frequency (MHz)	Target Power (dBm)	Tolerance (dBm)	Lower Tolerance (dBm)	Upper Tolerance (dBm)
BT-LE (GFSK) 1Mbps	2402-2480MHz	8	+ -1	7	9
BT-LE (GFSK) 2Mbps	2402-2480MHz	7	+ -1	6	8
802.11b	2412-2462MHz	21	+ -1	20	22
802.11g	2412-2462MHz	18	+ -1	17	19
802.11n HT20	2412-2462MHz	18	+ -1	17	19
Wi-Fi 5GHz(Band1)	5150-5250MHz	19	+ -2	17	21
Wi-Fi 5GHz(Band2)	5250-5350MHz	19	+ -2	17	21
Wi-Fi 5GHz(Band3)	5500-5725MHz	18	+ -3	15	21
Wi-Fi 5GHz(Band4)	5725-5850MHz	19	+ -2	17	21

The measured conducted Average Power

Mode	Frequency (MHz)	Averaged Power (dBm)
BT-LE (GFSK) 1Mbps	2440	7.82
BT-LE (GFSK) 2Mbps	2402	6.53
802.11b	2462	20.34
802.11g	2462	17.93
802.11n HT20	2462	17.87
Wi-Fi 5GHz(Band1)	5230	19.10
Wi-Fi 5GHz(Band2)	5300	19.12
Wi-Fi 5GHz(Band3)	5500	19.91
Wi-Fi 5GHz(Band4)	5745	19.61

Worst Antenna: (PCB Antenna)

FREQUENCY BAND (MHz)	MAX AVERAGE POWER (dBm)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/cm <sup>2</sup> )	LIMIT (mW/cm <sup>2</sup> )
BT	9	2.41	20	0.002753	1.0
Wi-Fi 2.4GHz	22	2.41	20	0.054920	1.0
Wi-Fi 5GHz	21	1.60	20	0.036202	1.0

### CONCLUSION:

The BT and Wi-Fi can transmit simultaneously, but Wi-Fi 2.4G and Wi-Fi 5G can not transmit simultaneously, the formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + .....etc. < 1$$

**CPD = Calculation power density**

**LPD = Limit of power density**

$$(0.002753 / 1) + (0.054920 / 1) = 0.057673 < 1, \text{ which is less than the "1" limit.}$$

--- END ---