

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 |

IC RSS-102 Issue 5

IEEE C95.3

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

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Approved by Glyn He
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Date: Jul. 18, 2022

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Test Report No.: IM2207WDG0104

RELEASE CONTROL RECORD

| ISSUE NO. | REASON FOR CHANGE | DATE ISSUED |
|---------------|---|---------------|
| IM2202WDG0092 | Original release | May 19, 2022 |
| IM2207WDG0104 | Based on the original report IM2202WDG0092 updated the label, but it doesn't need to be retested. | Jul. 18, 2022 |

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1. CERTIFICATION

| | |
|---------------------|--------------------------|
| IC: | 20127-P2 |
| PRODUCT: | Wi-Fi Module |
| BRAND NAME: | Particle |
| MODEL NO.: | P2 |
| TEST SAMPLE: | Engineering Sample |
| APPLICANT: | Particle Industries, Inc |
| STANDARDS: | IC RSS-102 Issue 5 |
| | IEEE C95.3 |



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 ²) | AVERAGE TIME (minutes) |
|--|-------------------------------|-------------------------------|-----------------------------------|------------------------|
| LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE | | | | |
| 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 |

F = Frequency in MHz

3. MPE CALCULATION FORMULA

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

where

Pd = power density in W/m²

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

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 (m) | POWER DENSITY (W/m²) | LIMIT (W/m²) |
|-----------------------------|--------------------------------|---------------------------|---------------------|--|--------------------------------|
| BT | 9 | 2.41 | 0.2 | 0.02753 | 5.41 |
| Wi-Fi 2.4GHz | 22 | 2.41 | 0.2 | 0.54920 | 5.44 |
| Wi-Fi 5GHz | 21 | 1.60 | 0.2 | 0.36202 | 9.43 |

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

$(0.02753/5.41) + (0.54920/5.44) = 0.10604 < 1$, which is less than the “1” limit.

--- END ---