

# FCC ID: 2BTR6-T901

## Maximum Permissible Exposure (MPE)

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

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> ) | Averaging time (minutes) |
|----------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposure</b>         |                               |                               |                                     |                          |
| 0.3-3.0                                                        | 614                           | 1.63                          | *100                                | 6                        |
| 3.0-30                                                         | 1842/f                        | 4.89/f                        | *900/f <sup>2</sup>                 | 6                        |
| 30-300                                                         | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300-1,500                                                      |                               |                               | f/300                               | 6                        |
| 1,500-100,000                                                  |                               |                               | 5                                   | 6                        |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                               |                                     |                          |
| 0.3-1.34                                                       | 614                           | 1.63                          | *100                                | 30                       |
| 1.34-30                                                        | 824/f                         | 2.19/f                        | *180/f <sup>2</sup>                 | 30                       |
| 30-300                                                         | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300-1,500                                                      |                               |                               | f/1500                              | 30                       |
| 1,500-100,000                                                  |                               |                               | 1.0                                 | 30                       |

f = frequency in MHz \* = Plane-wave equivalent power density

## MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 * P * G}{377 * D^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

## Measurement Result

BLE:

Operation Frequency: 2402MHz~2480MHz

Antenna gain: 2.7dBi;

R=20cm

| Channel Freq. (MHz) | modulation | conducted power | Tune-up power (dBm) | Max           |       | Antenna |         | Evaluation result | Power density |
|---------------------|------------|-----------------|---------------------|---------------|-------|---------|---------|-------------------|---------------|
|                     |            | (dBm)           |                     | tune-up power |       | Gain    |         | (mW/cm2 )         | (mW/cm2)      |
|                     |            |                 |                     | (dBm)         | (mW)  | (dBi)   | Numeric |                   |               |
| 2402                | BLE 1M     | 2.45            | 2±1                 | 3             | 1.995 | 2.70    | 1.86    | 0.0007            | 1             |
| 2440                |            | 2.82            | 2±1                 | 3             | 1.995 | 2.70    | 1.86    | 0.0007            | 1             |
| 2480                |            | 2.64            | 2±1                 | 3             | 1.995 | 2.70    | 1.86    | 0.0007            | 1             |
| 2402                | BLE 2M     | 2.52            | 2±1                 | 3             | 1.995 | 2.70    | 1.86    | 0.0007            | 1             |
| 2440                |            | 2.85            | 2±1                 | 3             | 1.995 | 2.70    | 1.86    | 0.0007            | 1             |
| 2480                |            | 2.71            | 2±1                 | 3             | 1.995 | 2.70    | 1.86    | 0.0007            | 1             |

ANT+:

Operation Frequency: 2457MHz

Antenna gain: 2.7dBi;

R=20cm

Transmit power:

| Mode    | Frequency (MHz) | Max Peak level<br>(dBuV/m) | EIRP power<br>(dBm) | Conducted power<br>(dBm) |
|---------|-----------------|----------------------------|---------------------|--------------------------|
| ANT+ 1M | 2457            | 77.99                      | -17.21              | -19.91                   |
| ANT+ 2M | 2457            | 75.95                      | -19.25              | -21.95                   |

EIRP=E-104.8+20log(D)

Conducted power = EIRP-antenna gain

| Channel Freq.<br>(MHz) | ANT  | modulation | conducted<br>power | Tune-up<br>power (dBm) | Max           |       | Antenna |         | Evaluation<br>result | Power density<br>Limits |
|------------------------|------|------------|--------------------|------------------------|---------------|-------|---------|---------|----------------------|-------------------------|
|                        |      |            | (dBm)              |                        | tune-up power |       | Gain    |         |                      |                         |
|                        |      |            |                    |                        | (dBm)         | (mW)  | (dBi)   | Numeric | (mW/cm2 )            | (mW/cm2)                |
| 2457                   | ANT1 | ANT+ 1M    | -19.91             | -19±1                  | -18           | 0.016 | 2.7     | 1.86    | 0.00001              | 1                       |
| 2457                   | ANT1 | ANT+ 2M    | -21.95             | -21±1                  | -20           | 0.010 | 2.7     | 1.86    | 0.00001              | 1                       |

## SIMULTANEOUS TRANSMISSIONS

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE. To comply with the MPE, the fraction of the MPE in terms of  $E^2$ ,  $H^2$  (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity. In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

BLE and ANT+ share the same antenna and cannot transmit simultaneously.

### Conclusion:

For the max result :  $0.0007 \leq 1.0$  for Max Power Density, compliance RF exposure.

Signature: 

Date: 2025-12-24

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