

## 4 FCC§15.247(i), §1.1310, § 2.1091- Maximum Permissible Exposure (MPE)

### 4.1 Applicable Standard

According to 15.247(i) and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

#### Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

| (B) Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                          |
|---------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| Frequency Range (MHz)                                   | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minutes) |
| 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                       |
| 300–1500                                                | /                             | /                             | f/1500                              | 30                       |
| 1500–100,000                                            | /                             | /                             | 1.0                                 | 30                       |

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

According to §1.1310 and §2.1091 RF exposure is calculated.

**Calculated Formulary:** Predication of MPE limit at a given distance

$S = PG/4\pi R^2$  = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

## 4.2 RF Exposure Evaluation Result

### MPE Evaluation:

| Mode       | Frequency Range (MHz) | Antenna Gain |           | Target Power |         | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|------------|-----------------------|--------------|-----------|--------------|---------|--------------------------|-------------------------------------|---------------------------------|
|            |                       | (dBi)        | (numeric) | (dBm)        | (mW)    |                          |                                     |                                 |
| Wi-Fi 2.4G | 2412-2462             | -0.50        | 0.891     | 26.00        | 398.107 | 20                       | 0.0706                              | 1                               |

### FCC ID K7T-RB1000

| Mode | Frequency Range (MHz) | Antenna Gain |           | Target Power |        | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|------|-----------------------|--------------|-----------|--------------|--------|--------------------------|-------------------------------------|---------------------------------|
|      |                       | (dBi)        | (numeric) | (dBm)        | (mW)   |                          |                                     |                                 |
| BLE  | 2402-2480             | 1.07         | 1.2794    | 0.50         | 1.1220 | 20                       | 0.0003                              | 1                               |

### FCC ID K7T-BPM2001

| Mode | Frequency Range (MHz) | Antenna Gain |           | Target Power |        | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|------|-----------------------|--------------|-----------|--------------|--------|--------------------------|-------------------------------------|---------------------------------|
|      |                       | (dBi)        | (numeric) | (dBm)        | (mW)   |                          |                                     |                                 |
| BLE  | 2402-2480             | -1.00        | 0.7943    | 9.50         | 8.9125 | 20                       | 0.0014                              | 1                               |

### FCC ID K7T-RB8762

| Mode | Frequency Range (MHz) | Antenna Gain |           | Target Power |        | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|------|-----------------------|--------------|-----------|--------------|--------|--------------------------|-------------------------------------|---------------------------------|
|      |                       | (dBi)        | (numeric) | (dBm)        | (mW)   |                          |                                     |                                 |
| BLE  | 2402-2480             | 2.00         | 1.5849    | -2.00        | 0.6310 | 20                       | 0.0002                              | 1                               |

Wi-Fi and BLE can transmit simultaneously, MPE evaluation is as below formula:

$PD1/Limit1 + PD2/Limit2 + \dots < 1$ , PD (Power Density)

The worst case is as below:

Max MPE of Wi-Fi + Max MPE of BLE  
 $= 0.0706/1.0 + 0.0014/1 = 0.0720 < 1.0$

**Result:** MPE evaluation of single and simultaneous transmission meet 20 cm the requirement of standard