

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

### 4.1 Applicable Standard

According to subpart 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);

### 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)    |                          |                                     |                                 |
| BR+EDR     | 2402-2480             | 4            | 2.512     | -4.00        | 0.398   | 20                       | 0.0002                              | 1                               |
| BLE        | 2402-2480             | 4            | 2.512     | 6.00         | 3.981   | 20                       | 0.0020                              | 1                               |
| Wi-Fi 2.4G | 2412-2462             | 4            | 2.512     | 23.00        | 199.526 | 20                       | 0.0997                              | 1                               |

**Result:** MPE evaluation meet 20 cm the requirement of standard.