

## FCC §15.407(f) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### Applicable Standard

According to subpart 15.407(f) 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.

**Per 447498 D01 General 25 RF Exposure Guidance v05r01**, simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is  $\leq 1.0$ .

### 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);

**Calculated Data:**

| RF module                   | Frequency band  | Antenna Gain |           | Conducted Power | Duty cycle | Evaluation | Power Density         | MPE Limit             | MPE Ratios   |
|-----------------------------|-----------------|--------------|-----------|-----------------|------------|------------|-----------------------|-----------------------|--------------|
|                             | (MHz)           | (dBi)        | (numeric) | (mW)            | (%)        | (cm)       | (mW/cm <sup>2</sup> ) | (mW/cm <sup>2</sup> ) | (%)          |
| WIFI*                       | 2412-2462       | 2.1          | 1.62      | 117             | 100        | 20         | 0.038                 | 1                     | 3.77         |
|                             | 2422-2452       | 2.1          | 1.62      | 32              | 100        | 20         | 0.010                 | 1                     | 1.03         |
|                             | 5475-5825       | 2.1          | 1.62      | 36              | 100        | 20         | 0.012                 | 1                     | 1.16         |
|                             | 5755-5795       | 2.8          | 1.91      | 120             | 100        | 20         | 0.046                 | 1                     | <b>4.56</b>  |
|                             | 5190-5230       | 3.8          | 2.40      | 30              | 100        | 20         | 0.014                 | 1                     | 1.43         |
|                             | 5180-5240       | 3.8          | 2.40      | 32              | 100        | 20         | 0.015                 | 1                     | 1.53         |
| BT                          | 2402-2480       | 2.5          | 1.78      | 4               | 100        | 20         | 0.001                 | 1                     | <b>0.13</b>  |
| CDMA**                      | 824.7-848.31    | 2.1          | 1.62      | 298             | 100        | 20         | 0.096                 | 0.55                  | <b>17.48</b> |
|                             | 1851.25-1908.75 | 3.0          | 2.00      | 274             | 100        | 20         | 0.109                 | 1                     | 10.86        |
| Total sum of MPE ratios (%) |                 |              |           |                 |            |            |                       |                       | 22.17        |

**Note:**

\* For WIFI module, 2.4GHz and 5GHz band can't transmit simultaneously, the worst case for MPE was chosen to be added up.

\* For CDMA module, the worst case for MPE was chosen to be added up.

**Result:** 22.17 % < 1, the device meet FCC MPE at 20 cm distance.