

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

### **Applicable Standard**

According to subpart §2.1091 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>(B) Limits for General Population/Uncontrolled Exposure</b> |                                      |                                      |                                          |                                 |
|----------------------------------------------------------------|--------------------------------------|--------------------------------------|------------------------------------------|---------------------------------|
| <b>Frequency Range (MHz)</b>                                   | <b>Electric Field Strength (V/m)</b> | <b>Magnetic Field Strength (A/m)</b> | <b>Power Density (mW/cm<sup>2</sup>)</b> | <b>Averaging Time (minutes)</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                              |
| 300-1500                                                       | /                                    | /                                    | 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:

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

**Calculated Data:**

| Mode       | Frequency Range (MHz) | Antenna Gain |           | ★Tune-up Output Power |        | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|------------|-----------------------|--------------|-----------|-----------------------|--------|--------------------------|-------------------------------------|---------------------------------|
|            |                       | (dBi)        | (numeric) | (dBm)                 | (mW)   |                          |                                     |                                 |
| 2.4G Wi-Fi | 2412~2462             | 3.76         | 2.38      | 15.0                  | 31.62  | 20                       | 0.0150                              | 1.0                             |
| Lora       | 902.3-927.7           | 4.39         | 2.75      | 26.5                  | 446.68 | 20                       | 0.2443                              | 0.6015                          |
| BLE        | 2402-2480             | 2.9          | 1.95      | 2.0                   | 1.58   | 20                       | 0.0006                              | 1.0                             |
| GSM850     | 824-849               | 2.41         | 1.74      | 25.97                 | 395.37 | 20                       | 0.1368                              | 0.5493                          |
| GSM1900    | 1850-1910             | 3.18         | 2.08      | 22.97                 | 198.15 | 20                       | 0.082                               | 1.0                             |
| WCDMA II   | 1850-1910             | 3.18         | 2.08      | 25                    | 316.23 | 20                       | 0.1308                              | 1.0                             |
| WCDMA V    | 824-849               | 2.41         | 1.74      | 25                    | 316.23 | 20                       | 0.1095                              | 0.5493                          |
| LTE Band 2 | 1850-1910             | 3.18         | 2.08      | 25                    | 316.23 | 20                       | 0.1308                              | 1.0                             |
| LTE Band 4 | 1710-1755             | 3.12         | 2.05      | 25                    | 316.23 | 20                       | 0.1290                              | 1.0                             |
| LTE Band 5 | 824-849               | 2.41         | 1.74      | 25                    | 316.23 | 20                       | 0.1095                              | 0.5493                          |
| LTE Band 7 | 2500-2570             | 3.76         | 2.38      | 25                    | 316.23 | 20                       | 0.1497                              | 1.0                             |

**Note:** 1. For the above tune up power were declared by the manufacturer.

2. The EUT contains a certificated Lora module, FCC ID: N8N4WNC-2K930NE0, Date of Grant: 2025/09/18

3. The EUT contains a certificated BLE module, FCC ID: 2AFOS-WT-LE5110X, Date of Grant: 2025/06/23

4. The EUT contains a certificated LTE module, FCC ID: XMR202006EC25AUX, Date of Grant: 2020/07/01  
Wi-Fi, Lora, BLE, and 2G/3G/4G can transmit simultaneously:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.015/1.0 + 0.2443/0.6015 + 0.0006/1.0 + 0.1368/0.5493 = 0.671 < 1.0$$

**Result:** The device meets MPE at distance 20cm.