

## FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### 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.

### Calculation formula:

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$  = 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 (MHz) | Antenna Gain |           | Conducted output power including Tune-up Tolerance |        | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|--------------|-----------------|--------------|-----------|----------------------------------------------------|--------|--------------------------|-------------------------------------|---------------------------------|
|              |                 | (dBi)        | (numeric) | (dBm)                                              | (mW)   |                          |                                     |                                 |
| WLAN         | 2412-2462       | 5            | 2.51      | 21                                                 | 316.23 | 20.00                    | 0.16                                | 1.0                             |
| WCDMA band 2 | 1850-1910       | 3.0          | 2.00      | 23.5                                               | 224    | 20.00                    | 0.09                                | 1.0                             |
| WCDMA Band 5 | 824-849         | 1.1          | 1.29      | 23.5                                               | 223.87 | 20.00                    | 0.06                                | 0.55                            |
| LTE band 2   | 1850-1910       | 3.0          | 2.00      | 24                                                 | 251.19 | 20.00                    | 0.10                                | 1.0                             |
| LTE band 4   | 1710-1755       | 2.7          | 1.86      | 24                                                 | 251.19 | 20.00                    | 0.09                                | 1.0                             |
| LTE band 12  | 699-716         | 1.0          | 1.26      | 24                                                 | 251.19 | 20.00                    | 0.06                                | 0.47                            |

The device contains a WWAN RF module, FCC ID: XMR201605EC25A, The WLAN and WWAN can transmit simultaneously:

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

$$=S_{WLAN}/S_{limit-WLAN}+S_{WWAN}/S_{limit-WWAN}$$

$$=0.16/1+0.06/0.47$$

$$=0.29$$

$$< 1.0$$

**Result:** The device meet FCC MPE at 20 cm distance