

## 6. RF EXPOSURE EVALUATION

### 6.1 Maximum Permissible Exposure (MPE)

#### Applicable Standard

According to subpart §1.1310,15.247(i) 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)                            | 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 <sup>▲</sup> |           | Conducted output power including Tune-up Tolerance <sup>▲</sup> |        | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|-----------|-----------------|---------------------------|-----------|-----------------------------------------------------------------|--------|--------------------------|-------------------------------------|---------------------------------|
|           |                 | (dBi)                     | (numeric) | (dBm)                                                           | (mW)   |                          |                                     |                                 |
| 2.4G WiFi | 2412-2462       | 6.26                      | 4.23      | 27.5                                                            | 562.34 | 20.00                    | 0.4731                              | 1.0                             |
| SRD       | 920-920.8       | 2.97                      | 1.98      | -9.92                                                           | 0.10   | 20.00                    | 0.00004                             | 0.6                             |

Note:

1. For SRD, field strength is 88.25dBμV/m @ 3m = -6.95 dBm EIRP. Conducted power is -9.92dBm.

2. The Antenna Gain and Conducted output power including Tune-up Tolerance provided by manufacturer

**For Simultaneous transmission:**

SRD and 2.4G Wifi can transmit simultaneously:

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

$$= S_{2.4G\ Wifi} / S_{limit-2.4G\ Wifi} + S_{SRD} / S_{limit-SRD}$$

$$= 0.4731 / 1.0 + 0.00004 / 0.6$$

$$= 0.47317$$

$$< 1.0$$

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