

## 4 FCC §1.1310, §2.1091, §15.407(f) - Maximum Permissible Exposure (MPE)

### 4.1 Applicable Standard

According to §15.407(f), U-NII devices are subject to the radio frequency radiation exposure requirements specified in § 1.1307(b), and 2.1091 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request

#### 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/4πR<sup>2</sup> = 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:

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

### 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)     |                          |                                     |                                 |
| Wi-Fi 2.4G  | 2412-2462             | 3.20         | 2.0893    | 27.00        | 501.1872 | 20                       | 0.2084                              | 1                               |
| Wi-Fi 5G B1 | 5150-5250             | 3.20         | 2.0893    | 21.00        | 125.8925 | 20                       | 0.0524                              | 1                               |
| Wi-Fi 5G B4 | 5725-5850             | 3.20         | 2.0893    | 23.00        | 199.5262 | 20                       | 0.0830                              | 1                               |

Wi-Fi 2.4G and Wi-Fi 5G can transmit simultaneously, MPE evaluation is as below formula:

PD1/Limit1+PD2/Limit2+..... < 1, PD (Power Density)

**The worst case is as below:**

Max MPE of Wi-Fi 2.4G + Max MPE of Wi-Fi 5G B4 = 0.2084/1.0+0.0830/1 =0.2914 < 1.0

**Result:** MPE evaluation of single and simultaneous transmission meet the requirement of standard.