

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) Limits for General Population/Uncontrolled Exposure | | | | |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm ²) | Averaging Time (minutes) |
| 0.3-1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34-30 | 824/f | 2.19/f | *(180/f ²) | 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/4πR² = power density (in appropriate units, e.g. mW/cm²);

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 ²) | MPE Limit (mW/cm ²) | MPE Ratio |
|-----------|-----------------------|--------------|-------------|----------------------|--------|--------------------------|-------------------------------------|---------------------------------|-----------|
| | | (dBi) | (numerical) | (dBm) | (mW) | | | | |
| 2.4G WIFI | 2412~2462 | 6 | 3.98 | 28.50 | 707.95 | 30 | 0.2491 | 1.0 | 0.2491 |
| 5G WIFI | 5150~5250 | 6 | 3.98 | 30.00 | 1000 | 30 | 0.3520 | 1.0 | 0.3520 |
| | 5725~5850 | 6 | 3.98 | 30.00 | 1000 | 30 | 0.3520 | 1.0 | 0.3520 |

Note:

1. For the above tune up power were declared by the manufacturer.
2. 2.4G Wi-Fi and 5G WIFI can transmit simultaneously.

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.2491/1.00 + 0.3520/1 = 0.2491 + 0.3520 = 0.6011 < 1.0$$

Result: The device meet FCC MPE at 30 cm distance.