

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

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

| 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

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = 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:

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

| Mode | Frequency (MHz) | Antenna Gain | | Tune up conducted power | | Evaluation Distance (cm) | Power Density (mW/cm ²) | MPE Limit (mW/cm ²) |
|------------|-----------------|--------------|-----------|-------------------------|--------|--------------------------|-------------------------------------|---------------------------------|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| Bluetooth | 2402-2480 | 2.0 | 1.58 | 4.0 | 2.51 | 20 | 0.0008 | 1 |
| BLE | 2402-2480 | 2.0 | 1.58 | 6.0 | 3.98 | 20 | 0.0013 | 1 |
| 2.4G Wi-Fi | 2412-2462 | 2.0 | 1.58 | 21.0 | 125.89 | 20 | 0.04 | 1 |
| 5G Wi-Fi | 5150-5250 | 2.0 | 1.58 | 17.0 | 50.12 | 20 | 0.016 | 1 |
| | 5250-5350 | 2.0 | 1.58 | 17.0 | 50.12 | 20 | 0.016 | 1 |
| | 5470-5725 | 2.0 | 1.58 | 16.0 | 39.81 | 20 | 0.013 | 1 |
| | 5725-5850 | 2.0 | 1.58 | 17.0 | 50.12 | 20 | 0.016 | 1 |

Note: 1. the tune up conducted power was declared by the applicant
 2. the 2.4G Wi-Fi can transmit at the same time with the 5G Wi-Fi. The Bluetooth can't transmit at the same time with Wi-Fi.

Simultaneous transmitting consideration:

The ratio= $MPE_{2.4G}/limit + MPE_{5G}/limit = 0.0016 + 0.04 = 0.0416 < 1.0$

So simultaneous exposure comply with the limit.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliance