

Maximum Permissible Exposure

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) Radiation as specified in §1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

For mobile or fixed location transmitters, no SAR consideration applied. The minimum separation generally be used is at least 20cm, even if the calculation indicate that the MPE distance would be lesser.

MPE Calculation Method

Calculation

$$\text{Given } E = \sqrt{\frac{30 \times P \times G}{d}} \quad \& \quad S = \frac{E^2}{3770}$$

Where E = Field Strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts / square centimeter

For 2.4G WIFI

The maximum output power for Module 1 is 14.33 dBm (27.10mW) at 2462MHz, (with -1 dBi antenna gain (0.79 numeric antenna gain))

output power=27.10mW

Numeric Antenna gain=0.79 Substituting the MPE safe distance using d=20cm into above equation.

Yields: $S=0.000199 \times P \times G$

Where P = Power in mW

G = Numeric antenna 0.79 gain

S = Power density in mW/cm²

Total Power density=0.0042 mW/cm²

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm even if the calculation indicates that the power density would be larger.)

For 2.4G BLE

The maximum output power is -0.393 dBm (0.91mW) at 2440MHz, (with -1 dBi antenna gain (0.79 numeric antenna gain))

Numeric Antenna gain=0.96 Substituting the MPE safe distance using $d=20\text{cm}$ into above equation.

Yields: $S=0.000199 \cdot P \cdot G$

Where P =Power in mW

G =Numeric antenna gain

S =Power density in mW/cm²

Total Power density=0.00014 mW/cm² (For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.)