# 4   FCC §15.247(i), §1.1310, § 2.1091 - Maximum Permissible Exposure (MPE)

## 4.1   Applicable Standard

According to subpart 15.247(i)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/cm²) | Averaging Time (minutes) |
| 0.3–1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34–30 | 824/f | 2.19/f | *(180/f²) | 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:**

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

## 4.2　RF Exposure Evaluation Result

**MPE evaluation:**

| Mode | Frequency Range (MHz) | Antenna Gain | | Target Power | | Evaluation Distance (cm) | Power Density (mW/cm$^2$) | MPE Limit (mW/cm$^2$) |
|---|---|---|---|---|---|---|---|---|
| | | (dBi) | (numeric) | (dBm) | (mW) | | | |
| Wi-Fi 2.4G | 2412-2462 | 2.50 | 1.778 | 23.00 | 199.526 | 20 | 0.0706 | 1 |
| BLE | 2402-2480 | 2.50 | 1.778 | 3.00 | 1.995 | 20 | 0.0007 | 1 |
| BR+EDR | 2402-2480 | 2.50 | 1.778 | -4.00 | 0.398 | 20 | 0.0001 | 1 |

The Wi-Fi and BT can transmit simultaneously:

$= S_{Wi-Fi}/S_{limit-Wi-Fi} + S_{BLE}/S_{limit-BLE} = 0.0706 + 0.0007 = 0.0713 < 1.0$

**Result:** MPE evaluation meet 20 cm the requirement of standard.