# RF EXPOSURE EVALUATION

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

## MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 * P * G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$Pd = \frac{30 * P * G}{377 * D^2}$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

## Measurement Result

Operation Frequency: 2402MHz-2480MHz; 2412MHz-2462MHz;

Antenna Type: ANT1:FPCB Antenna (BLE/2.4G WIFI)
ANT2:FPCB Antenna (2.4G WIFI)

Antenna gain: ANT1: 1.28dBi (BLE/2.4G WIFI)
ANT2: 1.28dBi (2.4G WIFI)

R=20cm

**Maximum Single sources**

| Band | Max Conducted (dBm) | Antenna Gain (dBi) | Separation distance (cm) | Evaluation result (mW/cm2 ) | Power density Limits (mW/cm2) | Verdict |
|---|---|---|---|---|---|---|
| BLE-1M | 5.11 | 1.28 | 20 | 0.000866 | 1 | PASS |
| BLE-2M | 5.12 | 1.28 | 20 | 0.000868 | 1 | PASS |
| Wi-Fi 2.4G ANT1 | 16.02 | 1.28 | 20 | 0.010684 | 1 | PASS |
| Wi-Fi 2.4G ANT2 | 16.03 | 1.28 | 20 | 0.010708 | 1 | PASS |

Note:
1. NO simultaneous transmissions are possible for this device of Wi-Fi 2.4G + BT.
2. NO simultaneous transmissions are possible for this device of Wi-Fi 2.4G ANT1+ Wi-Fi 2.4G ANT2.

The conclusion should be 0.010708＜1 for Max Power Density, Compliance the RF Exposure requirement.

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