

## RF exposure

According to FCC part 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 <sup>2</sup> ) | Average time |
|---|------------------------------|-------------------------------|-------------------------------------|--------------|
| (A) Limits for Occupational / Control Exposures         |                              |                               |                                     |              |
| 300 – 1 500   | --                           | --                            | f/300                               | 6            |
| 1 500 - 100000  | --                           | --                            | 5                                   | 6            |
| (B) Limits for General Population / Uncontrol Exposures |                              |                               |                                     |              |
| 300 – 1 500   | --                           | --                            | f/1500                              | 6            |
| 1 500 – 100 000   | --                           | --                            | 1                                   | 30           |

f= frequency in MHz

Friis transmission formula:  $P_d = (P_{out} \times G) / (4 \times \pi \times R^2)$

Where,

$P_d$  = power density in  $\text{mW/cm}^2$

$P_{out}$  = output power to antenna in  $\text{mW}$

G = gain of antenna in linear scale

$\pi = 3.1416$

R = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE,  $1 \text{ mW/cm}^2$ . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

### Results (Worst case)

| Mode | Max tune-up power (dBm) | Antenna gain (dBi) | Power density at 20 cm( $\text{mW/cm}^2$ ) | Limit ( $\text{mW/cm}^2$ ) |
|------|-------------------------|--------------------|--|----------------------------|
| BLE  | -7                      | 0.80               | 0.000 05                                   | 1                          |