

## 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 mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in 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,  $f/1500$  mW/cm<sup>2</sup>. 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

| Channel | Frequency (MHz) | Peak output power (dBm) | Antenna gain (dBi) | Power density at 20 cm(mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) |
|---------|-----------------|-------------------------|--------------------|---------------------------------------------|-----------------------------|
| Low     | 450.012 5       | 11.74                   | -2.61              | 0.001 63                                    | 1.50                        |
| Middle  | 457.575 0       | 11.62                   | -2.61              | 0.001 58                                    | 1.53                        |
| High    | 469.975 0       | 11.38                   | -2.61              | 0.001 50                                    | 1.57                        |