

## 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/cm²) | 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/cm²

$P_{out}$  = 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, 1 mW/cm². 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

#### - 5.2G

| Operation mode  |      | Max tune-up Average power (dBm) | Antenna gain (dBi) | Power density at 20 cm(mW/cm²) | Limit (mW/cm²) |
|-----------------|------|---------------------------------|--------------------|--------------------------------|----------------|
| 802.11ac(VHT20) | SISO | 9.00                            | 2.72               | 0.00296                        | 1              |
| 802.11ac(VHT40) | SISO | 7.50                            | 2.72               | 0.00209                        | 1              |
| 802.11ac(VHT80) | SISO | 8.00                            | 2.72               | 0.00235                        | 1              |

#### - 5.3G

| Operation mode  |      | Max tune-up Average power (dBm) | Antenna gain (dBi) | Power density at 20 cm(mW/cm²) | Limit (mW/cm²) |
|-----------------|------|---------------------------------|--------------------|--------------------------------|----------------|
| 802.11ac(VHT20) | SISO | 7.50                            | 2.72               | 0.00209                        | 1              |
| 802.11ac(VHT40) | SISO | 7.00                            | 2.72               | 0.00187                        | 1              |
| 802.11ac(VHT80) | SISO | 6.50                            | 2.72               | 0.00166                        | 1              |

**- 5.5G**

| Operation mode  |      | Max tune-up<br>Average power<br>(dBm) | Antenna<br>gain (dBi) | Power density<br>at 20 cm (mW/cm <sup>2</sup> ) | Limit<br>(mW/cm <sup>2</sup> ) |
|-----------------|------|---------------------------------------|-----------------------|-------------------------------------------------|--------------------------------|
| 802.11ac(VHT20) | SISO | 8.50                                  | 3.45                  | 0.00312                                         | 1                              |
| 802.11ac(VHT40) | SISO | 8.50                                  | 3.45                  | 0.00312                                         | 1                              |
| 802.11ac(VHT80) | SISO | 7.50                                  | 3.45                  | 0.00248                                         | 1                              |

**- 5.8G**

| Operation mode  |      | Max tune-up<br>Average power<br>(dBm) | Antenna<br>gain (dBi) | Power density<br>at 20 cm (mW/cm <sup>2</sup> ) | Limit<br>(mW/cm <sup>2</sup> ) |
|-----------------|------|---------------------------------------|-----------------------|-------------------------------------------------|--------------------------------|
| 802.11ac(VHT20) | SISO | 11.00                                 | 5.63                  | 0.00916                                         | 1                              |
| 802.11ac(VHT40) | SISO | 11.00                                 | 5.63                  | 0.00916                                         | 1                              |
| 802.11ac(VHT80) | SISO | 10.50                                 | 5.63                  | 0.00816                                         | 1                              |