

## 5.4. RF EXPOSURE REQUIREMENTS [§§ 15.247(b)(4), 1.1310 & 2.1091]

### 5.4.1. Limits

- **FCC 15.247(b)(4):** Systems operating under provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See @ 1.1307(b)(1).
- **FCC 1.1310:-** The criteria listed in the following table shall be used to evaluate the environmental 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 (minutes) |
|----------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|------------------------|
| <b>(A) Limits for Occupational/Control Exposures</b>           |                               |                               |                                     |                        |
| 1500-100,000                                                   | ...                           | ...                           | 5                                   | 6                      |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                               |                                     |                        |
| 1500-100,000                                                   | ...                           | ...                           | 1.0                                 | 30                     |

F = Frequency in MHz

### 5.4.2. Method of Measurements

In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

- (1) Calculation that estimates the minimum separation distance (20 cm or more) between an Antenna and persons required to satisfy power density limits defined for free space.

#### Calculation Method of RF Safety Distance:

$$S = PG/4\pi r^2 = EIRP/4\pi r^2$$

Where:

- P: power input to the antenna in mW
- EIRP: Equivalent (effective) isotropic radiated power.
- S: power density mW/cm<sup>2</sup>
- G: numeric gain of antenna relative to isotropic radiator
- r: distance to centre of radiation in cm

$$r = \sqrt{PG/4\pi S}$$

- (2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
- (3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
- (4) Any other RF exposure related issues that may affect MPE compliance

### 5.4.3. Test Data

| Frequency (MHz)         | Highest Conducted Peak Power at the Antenna Terminal (dBm) | Maximum Antenna Gain (dBi) | Maximum Measured Total EIRP (dBm) | Minimum RF Safety Distance r (cm) |
|-------------------------|------------------------------------------------------------|----------------------------|-----------------------------------|-----------------------------------|
| <b>External Antenna</b> |                                                            |                            |                                   |                                   |
| 2412-2462               | 22.7                                                       | 4.0                        | 26.7                              | 6.1                               |
| 5745-5825               | 22.6                                                       | 4.3                        | 26.9                              | 6.2                               |
| <b>Internal Antenna</b> |                                                            |                            |                                   |                                   |
| 2412-2462               | 22.9                                                       | 5.0                        | 27.1                              | 6.4                               |
| 5745-5825               | 21.8                                                       | 4.3                        | 26.1                              | 5.7                               |

**Note:** RF EXPOSURE DISTANCE LIMITS:  $r = (PG/4IIS)^{1/2} = (EIRP/4IIS)^{1/2}$   
Limits for General Population/Uncontrolled Exposure:  $S = 1.0 \text{ mW/cm}^2$

| <b>Evaluation of RF Exposure Compliance Requirements</b>                                                                                                                                   |                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>RF Exposure Requirements</b>                                                                                                                                                            | <b>Compliance with FCC Rules</b>                                                                      |
| Minimum calculated separation distance between Antenna and persons: <b>6.4 cm</b>                                                                                                          | Manufacturer' instruction for separation distance between Antenna and persons required: <b>20 cm.</b> |
| Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement | N/A                                                                                                   |
| Caution statements and/or warning labels that are necessary in order to comply with the exposure limits                                                                                    | Refer to user's manual for RF Exposure information.                                                   |
| Any other RF exposure related issues that may affect MPE compliance                                                                                                                        | N/A                                                                                                   |