

**FCC §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

**Applicable Standard**

According to subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission’s guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                                      |                                      |  |                                 |
|--|--------------------------------------|--------------------------------------|--|---------------------------------|
| <b>Frequency Range (MHz)</b>                                   | <b>Electric Field Strength (V/m)</b> | <b>Magnetic Field Strength (A/m)</b> | <b>Power Density (mW/cm<sup>2</sup>)</b> | <b>Averaging Time (minutes)</b> |
| 0.3–1.34   | 614                                  | 1.63                                 | *(100)                                   | 30                              |
| 1.34–30  | 824/f                                | 2.19/f                               | *(180/f <sup>2</sup> )                   | 30                              |
| 30–300   | 27.5                                 | 0.073                                | 0.2                                      | 30                              |
| 300–1500   | /                                    | /                                    | f/1500                                   | 30                              |
| 1500–100,000   | /                                    | /                                    | 1.0                                      | 30                              |

f = frequency in MHz; \* = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

**Calculation formula:**

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$  = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

**Calculated Data:**

| Band     | Channel No. | Tune up RF Output Power (dBm) |                |                |                |
|----------|-------------|-------------------------------|----------------|----------------|----------------|
|          |             | GPRS 1 TX Slot                | GPRS 2 TX Slot | GPRS 3 TX Slot | GPRS 4 TX Slot |
| Cellular | 128         | 33.0                          | 33.0           | 31.0           | 31.0           |
|          | 190         | 33.0                          | 33.0           | 31.0           | 31.0           |
|          | 251         | 33.0                          | 33.0           | 31.0           | 31.0           |
| PCS      | 512         | 30.0                          | 30.0           | 28.0           | 28.0           |
|          | 661         | 30.0                          | 30.0           | 28.0           | 28.0           |
|          | 810         | 30.0                          | 30.0           | 28.0           | 28.0           |

The time based average power is relevant, the difference in between depends on the duty of the TDMA signal

| Number of Time slot  | 1     | 2     | 3        | 4     |
|--|-------|-------|----------|-------|
| Duty cycle   | 1:8   | 1:4   | 1:2.66   | 1:2   |
| Time based average power compared to slotted average power | -9 dB | -6 dB | -4.25 dB | -3 dB |

| Band     | Channel No. | Tune up time based average power (dBm) |                |                |                |
|----------|-------------|--|----------------|----------------|----------------|
|          |             | GPRS 1 TX Slot                         | GPRS 2 TX Slot | GPRS 3 TX Slot | GPRS 4 TX Slot |
| Cellular | 128         | 24.0                                   | 27.0           | 26.8           | 28.0           |
|          | 190         | 24.0                                   | 27.0           | 26.8           | 28.0           |
|          | 251         | 24.0                                   | 27.0           | 26.8           | 28.0           |
| PCS      | 512         | 21.0                                   | 24.0           | 23.8           | 25.0           |
|          | 661         | 21.0                                   | 24.0           | 23.8           | 25.0           |
|          | 810         | 21.0                                   | 24.0           | 23.8           | 25.0           |

| Frequency (MHz) | Tune up time based average power |        | Antenna Gain (dBi) | Evaluation Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | MPE Limit (mW/cm <sup>2</sup> ) |
|-----------------|----------------------------------|--------|--------------------|--------------------------|-------------------------------------|---------------------------------|
|                 | (dBm)                            | (mW)   |                    |                          |                                     |                                 |
| 824-849         | 28.0                             | 630.96 | 2.5                | 20.00                    | 0.22                                | 0.55                            |
| 1850-1910       | 25.0                             | 316.23 | 2.5                | 20.00                    | 0.11                                | 1.00                            |

**Result:** The device meet FCC MPE at 20 cm distance.