

## 4 FCC §2.1091 & IC RSS-102 - RF Exposure Information

### 4.1 Applicable Standards

FCC §2.1091 (a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular §1.1307(b).

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

Limits for Exposure

| Frequency Range (MHz)                                  | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minutes) |
|--|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposure</b> |                               |                               |                                     |                          |
| 0.3-1.34   | 614                           | 1.63                          | *(100)                              | 6                        |
| 1.34-30  | 1842/f                        | 4.89/f                        | *(900/f <sup>2</sup> )              | 6                        |
| 30-300   | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300-1500   | /                             | /                             | f/300                               | 6                        |
| 1500-100,000   | /                             | /                             | 5                                   | 6                        |

*f* = frequency in MHz

\* = Plane-wave equivalent power density

According to IC RSS-102 Issue 4 section 4.4, RF Field Strength Limits for Controlled Use Devices (Controlled Environment).

| Frequency Range (MHz) | Electric Field (V/m rms)      | Magnetic Field (A/m rms)                       | Power Density (W/m <sup>2</sup> ) | Averaging Time (minutes)        |
|-----------------------|-------------------------------|--|-----------------------------------|---------------------------------|
| 0.003-1               | 600                           | 4.9  | -                                 | 6                               |
| 1-10                  | 600/ <i>f</i>                 | 4.9/ <i>f</i>                                  | -                                 | 6                               |
| 10-30                 | 60                            | 4.9/ <i>f</i>                                  | -                                 | 6                               |
| 30-300                | 60                            | 0.163  | 10*                               | 6                               |
| 300-1500              | 3.54 <i>f</i> <sup>0.5</sup>  | 0.0094 <i>f</i> <sup>0.5</sup>                 | <i>f</i> /30                      | 6                               |
| 1500-15000            | 137                           | 0.364  | 50                                | 6                               |
| 15000-150000          | 137                           | 0.364  | 50                                | 616000/ <i>f</i> <sup>1.2</sup> |
| 150000-300000         | 0.354 <i>f</i> <sup>0.5</sup> | 9.4 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup> | 3.33 x 10 <sup>-4</sup> <i>f</i>  | 616000/ <i>f</i> <sup>1.2</sup> |

#### Antenna:

The manufacturer does not specify an antenna. This device has provisions for operation in a vehicle or a fixed location.

## 4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where:  $S$  = power density

$P$  = power input to antenna

$G$  = power gain of the antenna in the direction of interest relative to an isotropic radiator

$R$  = distance to the center of radiation of the antenna

### FCC Frequency: 809-824 MHz

|   |                |
|---|----------------|
| <u>Duty Cycle (TDMA 4 slots)</u>  | <u>25%</u>     |
| <u>Maximum peak output power at antenna input terminal (dBm):</u>                       | <u>34.8</u>    |
| <u>Maximum peak output power at antenna input terminal (mW):</u>                        | <u>3019.95</u> |
| <u>Prediction distance (cm):</u>  | <u>30</u>      |
| <u>Prediction frequency (MHz):</u>  | <u>809.1</u>   |
| <u>Maximum Antenna Gain, typical (dBi):</u>   | <u>16</u>      |
| <u>Maximum Antenna Gain (numeric):</u>  | <u>39.81</u>   |
| <u>Power density of prediction frequency at 30 cm (mW/cm<sup>2</sup>):</u>              | <u>2.658</u>   |
| <u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u> | <u>2.697</u>   |

### FCC Frequency: 854-869 MHz

|   |                |
|---|----------------|
| <u>Duty Cycle (TDMA 4 slots)</u>  | <u>25%</u>     |
| <u>Maximum peak output power at antenna input terminal (dBm):</u>                       | <u>34.1</u>    |
| <u>Maximum peak output power at antenna input terminal (mW):</u>                        | <u>2570.40</u> |
| <u>Prediction distance (cm):</u>  | <u>30</u>      |
| <u>Prediction frequency (MHz):</u>  | <u>854.1</u>   |
| <u>Maximum Antenna Gain, typical (dBi):</u>   | <u>16</u>      |
| <u>Maximum Antenna Gain (numeric):</u>  | <u>39.81</u>   |
| <u>Power density of prediction frequency at 30 cm (mW/cm<sup>2</sup>):</u>              | <u>2.262</u>   |
| <u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u> | <u>2.847</u>   |

### IC Frequency: 806-824 MHz

|   |                |
|---|----------------|
| <u>Duty Cycle (TDMA 4 slots)</u>  | <u>25%</u>     |
| <u>Maximum peak output power at antenna input terminal (dBm):</u>                     | <u>34.1</u>    |
| <u>Maximum peak output power at antenna input terminal (mW):</u>                      | <u>2570.40</u> |
| <u>Prediction distance (cm):</u>  | <u>30</u>      |
| <u>Prediction frequency (MHz):</u>  | <u>806.1</u>   |
| <u>Maximum Antenna Gain, typical (dBi):</u>   | <u>16</u>      |
| <u>Maximum Antenna Gain (numeric):</u>  | <u>39.81</u>   |
| <u>Power density of prediction frequency at 30 cm (W/m<sup>2</sup>):</u>              | <u>22.62</u>   |
| <u>MPE limit for uncontrolled exposure at prediction frequency (W/m<sup>2</sup>):</u> | <u>26.87</u>   |

**IC Frequency: 851-869 MHz**

|  |                                    |                |
|--|------------------------------------|----------------|
|  | <u>Duty Cycle (TDMA 4 slots)</u>   | <u>25%</u>     |
| Maximum peak output power at antenna input terminal (dBm):                       |                                    | <u>34.2</u>    |
| Maximum peak output power at antenna input terminal (mW):                        |                                    | <u>2630.27</u> |
|  | <u>Prediction distance (cm):</u>   | <u>30</u>      |
|  | <u>Prediction frequency (MHz):</u> | <u>851.1</u>   |
| Maximum Antenna Gain, typical (dBi):   |                                    | <u>16</u>      |
| Maximum Antenna Gain (numeric):  |                                    | <u>39.81</u>   |
| Power density of prediction frequency at 30 cm (W/m <sup>2</sup> ):              |                                    | <u>23.15</u>   |
| MPE limit for uncontrolled exposure at prediction frequency (W/m <sup>2</sup> ): |                                    | <u>28.37</u>   |

**Conclusion**

The device complies with the MPE requirements by providing a safe separation distance of at least 30 cm between the antenna with maximum 16 dBi gain, including any radiating structure, and any persons when normally operated.