

## 4 FCC §2.1091 & §15.407(f) - RF Exposure

### 4.1 Applicable Standard

According to FCC §15.407(f) and §1.1307(b)(1), 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 General Population/Uncontrolled Exposure

| Frequency Range (MHz)                               | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minutes) |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                          |
| 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

### 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

### 4.3 MPE Results

5.2 GHz band:

|   |               |
|---|---------------|
| <u>Maximum peak output power at antenna input terminal (dBm):</u>                       | <u>24.54</u>  |
| <u>Maximum peak output power at antenna input terminal (mW):</u>                        | <u>284.4</u>  |
| <u>Prediction distance (cm):</u>  | <u>20</u>     |
| <u>Prediction frequency (MHz):</u>  | <u>5230</u>   |
| <u>Maximum Antenna Gain, typical (dBi):</u>   | <u>3.5</u>    |
| <u>Maximum Antenna Gain (numeric):</u>  | <u>2.238</u>  |
| <u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>            | <u>0.1267</u> |
| <u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u> | <u>1.0</u>    |

## 5.8 GHz band:

|   |               |
|---|---------------|
| <u>Maximum peak output power at antenna input terminal (dBm):</u>                       | <u>24.99</u>  |
| <u>Maximum peak output power at antenna input terminal (mW):</u>                        | <u>315.5</u>  |
| <u>Prediction distance (cm):</u>  | <u>20</u>     |
| <u>Prediction frequency (MHz):</u>  | <u>5745</u>   |
| <u>Maximum Antenna Gain, typical (dBi):</u>   | <u>3.5</u>    |
| <u>Maximum Antenna Gain (numeric):</u>  | <u>2.238</u>  |
| <u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>            | <u>0.1405</u> |
| <u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u> | <u>1.0</u>    |

Note: There are two radios (2.4 GHz & 5 GHz) built into the system.

## 2.4 GHz band:

|   |                 |
|---|-----------------|
| <u>Maximum peak output power at antenna input terminal (dBm):</u>                       | <u>23.77</u>    |
| <u>Maximum peak output power at antenna input terminal (mW):</u>                        | <u>238.2319</u> |
| <u>Prediction distance (cm):</u>  | <u>20</u>       |
| <u>Prediction frequency (MHz):</u>  | <u>2437</u>     |
| <u>Maximum Antenna Gain, typical (dBi):</u>   | <u>2.5</u>      |
| <u>Maximum Antenna Gain (numeric):</u>  | <u>1.7782</u>   |
| <u>Power density of prediction frequency at 20.0 cm (mW/cm<sup>2</sup>):</u>            | <u>0.0842</u>   |
| <u>MPE limit for uncontrolled exposure at prediction frequency (mW/cm<sup>2</sup>):</u> | <u>1.0</u>      |

According to KDB 447498 D01 General RF Exposure Guidance v05r02, the sum of MPE ratio for two radios is:  $0.0842 + 0.1405 = 0.2247$ , which is smaller than 1.0. So the colocation exposure exclusion applies.