

## 1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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### 1.1 Standard Applicable

According to § 1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

#### (a) Limits for Occupational / Controlled Exposure

| Frequency range<br>(MHz) | Electric Field<br>Strength (E)<br>(V/m) | Magnetic Field<br>Strength (H)<br>(A/m) | Power Density<br>(S) (mW/cm <sup>2</sup> ) | Averaging Times<br>  E   <sup>2</sup> ,   H   <sup>2</sup> or<br>S (minutes) |
|--------------------------|---|---|--|--|
| 0.3-3.0                  | 614                                     | 1.63                                    | (100)*                                     | 6  |
| 3.0-30                   | 1842/f                                  | 4.89/f                                  | (900/f)*                                   | 6  |
| 30-300                   | 61.4                                    | 0.163                                   | 1.0  | 6  |
| 300-1500                 | /                                       | /                                       | F/300                                      | 6  |
| 1500-100000              | /                                       | /                                       | 5  | 6  |

#### (b) Limits for General Population / Uncontrolled Exposure

| Frequency range<br>(MHz) | Electric Field<br>Strength (E)<br>(V/m) | Magnetic Field<br>Strength (H)<br>(A/m) | Power Density<br>(S) (mW/cm <sup>2</sup> ) | Averaging Times<br>  E   <sup>2</sup> ,   H   <sup>2</sup> or<br>S (minutes) |
|--------------------------|---|---|--|--|
| 0.3-1.34                 | 614                                     | 1.63                                    | (100)*                                     | 30   |
| 1.34-30                  | 824/f                                   | 2.19/f                                  | (180/f)*                                   | 30   |
| 30-300                   | 27.5                                    | 0.073                                   | 0.2  | 30   |
| 300-1500                 | /                                       | /                                       | F/1500                                     | 30   |
| 1500-100000              | /                                       | /                                       | 1  | 30   |

Note: f = frequency in MHz: \* = Plane-wave equivalents power density

### 1.2 MPE Calculation Method

$$S = (30 * P * G) / (377 * R^2)$$

S = 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 (in appropriate units, e.g., cm)

### 1.3 MPE Calculation Result

Since the maximum eirp power is used as the output power to antenna, so the Gain of the antenna can be assumed as 0dBi.

Maximum peak output power: 8.91 (dBm)

Maximum peak output power at antenna input terminal: 7.7804(mW)

Prediction distance: >20 (cm)

Prediction frequency: 2405 (MHz)

Antenna gain (typical): 0 (dBi)

Antenna gain (typical): 1 (numeric)

The worst case is power density at prediction frequency at 5cm: 0.0015 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

$$0.0015 \text{ (mw/cm}^2\text{)} < 1 \text{ (mw/cm}^2\text{)}$$

Result: Pass