



APPENDIX L
: MAXIMUM PERMISSIBLE EXPOSURE



Maximum Permissible Exposure

1.1 Applicable Standard

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 levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device

(A) Limits for Occupational / Controlled Exposure

| Frequency range(MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density(S) (mW/cm ²) | Averaging Time E ² , H ² or 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 ~ 1,500 | | | f/300 | 6 |
| 1,500 ~ 100,000 | | | 5.0 | 6 |

(B) Limits for General Population / Uncontrolled Exposure

| Frequency range(MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density(S) (mW/cm ²) | Averaging Time E ² , H ² or 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 ~ 1,500 | | | f/1500 | 30 |
| 1,500 ~ 100,000 | | | 1.0 | 30 |

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

1.2 MPE Calculation Method

$$E(V/m) = \frac{\sqrt{30 \times P \times G}}{d}$$

$$\text{Power Density: } Pd(W/m^2) = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.



1.3 Calculated Result and Limit

Antenna type: chip antenna

| Antenna gain (dBi) | Antenna gain (numeric) | Peak output power (dBm) | Peak output power (mW) | Power Density (s) (mW/cm ²) | Limit of Power density (S) (mW/cm ²) |
|--------------------|------------------------|-------------------------|------------------------|---|--|
| 3.944 | 2.48 | 15.81 | 38.11 | 0.012 | 1 |