

## **Appendix A. Maximum Permissible Exposure**

## 1. 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> 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
300-1500	-	-	F/300	6
1500-100,000	-	-	5	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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> 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
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30

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

### 1.2. MPE Calculation Method

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

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

**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 : Patch antenna****Mode 1****Max Conducted Power for RFID: 8.39dBm**

<b>Test Mode</b>	<b>Min. User Distance (cm)</b>	<b>Gain (dBi)</b>	<b>Numeric Gain</b>	<b>Conducted Power (dBm)</b>	<b>Conducted Power (mW)</b>	<b>Power Density (mW/cm2)</b>
<b>2.4G</b>	20	9	7.943282	8.39	6.9024	<b>0.0109</b>

**Mode 2****Max Conducted Power for RFID: 8.39dBm**

<b>Test Mode</b>	<b>Min. User Distance (cm)</b>	<b>Gain (dBi)</b>	<b>Numeric Gain</b>	<b>Conducted Power (dBm)</b>	<b>Conducted Power (mW)</b>	<b>Power Density (mW/cm2)</b>
<b>2.4G</b>	20	5	3.162278	8.39	6.9024	<b>0.0043</b>

**Antenna Type : Dipole antenna****Mode 3****Max Conducted Power for RFID: 6.35dBm**

<b>Test Mode</b>	<b>Min. User Distance (cm)</b>	<b>Gain (dBi)</b>	<b>Numeric Gain</b>	<b>Conducted Power (dBm)</b>	<b>Conducted Power (mW)</b>	<b>Power Density (mW/cm2)</b>
<b>2.4G</b>	20	9	7.943282	6.35	4.3152	<b>0.0068</b>