

16. MAXIMUM PERMISSIBLE EXPOSURE

16.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment is 1 mW/cm² for PCS Band and 0.579 mW/cm² for Cellular Band.

The electric field generated for a 1mW/cm²exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1\text{mW/cm}^2 = 10\text{W/m}^2$$

Where

S = Power density in mW/cm², Z = Impedance of free space, 377Ω

E = Electric filed strength in Volts/m, G = Numeric antenna gain, and d = distance in meter

Combing equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30*P*G) / (3770 * S)}$$

Changing to units of mW and cm, using P (mW) = P (W) / 1000, d (cm) = 100 * d (m)

$$d = 0.282 * \sqrt{(P*G) / S}, \quad S = 0.282 * \sqrt{(P*G) / d}$$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

16.2 Calculated MPE Safe Distance

According to above equation, the following result was obtained.

Kind of Antenna	Peak Output Power		Antenna Gain		Power Density (mW/cm ²)
	(dBm)	(mW)	Log	Linear	
LINK Antenna	15.0	31.62	10.0	10.0	0.561 @ 80 cm Separation
Coverage Antenna	4.0	25.12	1.0	1.26	0.355 @ 20 cm Separation

According to above table,

The power density for Link Antenna, $S = 0.282 * \sqrt{31.62*10.0/80} = 0.561$

The power density for Coverage Antenna, $S = 0.282 * \sqrt{25.12*1.26/20} = 0.354$

Following Caution on the manual will be described.

“CAUTION: Exposure to Radio Frequency Radiation.

Antenna shall be mounted in such a manner to minimize the potential for human contact during normal operation. The antenna should not be contacted during operation to avoid the possibility of exceeding the FCC radio frequency exposure limit.”