

## 8.7. MAXIMUM PERMISSIBLE EXPOSURE

### CALCULATIONS

Given

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

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = distance in meters

S = Power Density in milliwatts / square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

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

Changing to units of mW and cm, using:

$$P (\text{mW}) = P (\text{W}) / 1000 \text{ and}$$

$$d (\text{cm}) = 100 * d (\text{m})$$

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

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

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW / cm<sup>2</sup>

Substituting the logarithmic form of power and gain using:

$$P (\text{mW}) = 10 ^{(\text{P} (\text{dBm}) / 10)} \text{ and}$$

$$G (\text{numeric}) = 10 ^{(\text{G} (\text{dBi}) / 10)}$$

yields

$$d = 0.282 * 10 ^{((P + G) / 20) / \sqrt{S}} \quad \text{Equation (1)}$$

where

d = MPE safe distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW / cm<sup>2</sup>

## RESULTS

No non-compliance noted:

EUT output power = 17.0 dBm

Antenna Gain = 4.8 dBi

S = 1.0 mW / cm<sup>2</sup> from 1.1310 Table 1

Substituting these parameters into Equation (1) above:

MPE Safe Distance = 3.5 cm

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.