

## 7.10. CO-LOCATED MAXIMUM PERMISSIBLE EXPOSURE

### LIMITS

§15.247 (b) (5) 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 of the Commission's guidelines. See §1.1307(b)(1) of this chapter.

### 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>

This equation is kept in the linear form to enable the proper summation of the power densities for each of the two radios:

$$d = 0.282 * \sqrt{\{ [(P1 * G1) + (P2 * G2)] / S \}} \quad \text{Equation (1)}$$

where

d = distance in cm  
P1 = Power of Radio 1 in mW  
G1 = Numeric antenna gain of Radio 1  
P2 = Power of Radio 2 in mW  
G2 = Numeric antenna gain of Radio 2  
S = Power Density in mW / cm<sup>2</sup>

Equation (1) and the measured peak power of each radio is used to calculate the MPE distance.

### **LIMITS**

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

### **CO-LOCATED RADIO RESULTS**

No non-compliance noted:

The dominant transmitter is the 802.11a mode:

P1 = 0.716 W  
G1 = 2.51

The non-dominant transmitter is the 802.11g mode:

P2 = 0.637 W  
G2 = 1.41

Substituting actual values into Equation (1) yields:

D = 14.6 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.