

**Prediction of MPE limit at given distance**

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG / 4\pi R^2$$

where: S = Power density  
 P = Power input to the antenna  
 G = Antenna gain  
 R = Distance to the center of radiation of the antenna

Solving this equation for G

$$G = S (4\pi R^2) / P$$

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled "Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure"

| Frequency Range (MHz) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minutes) |
|-----------------------|-------------------------------------|--------------------------|
| 300 -1500             | f/1500                              | 30                       |
| 1500 - 100000         | 1.0                                 | 30                       |

where f = Frequency (MHz)

Based on the above table the limits are for  
 Part 24 device: 1 mW/cm<sup>2</sup>  
 Part 22 device: 0.567 mW/cm<sup>2</sup>

**Prediction for Part 24:**

P Max power input to the antenna: 29.2 dBm / 0.832 W  
 R Distance: 20 cm  
 S MPE limit for uncontrolled exposure: 1 mW/cm<sup>2</sup>  
  
 G Antenna gain: 6.04 numerical  
 G Antenna gain: 7.81 dBi

EIRP peak power limit according to §24.232(b): 2 W / 33 dBm

**Therefore the maximum antenna gain for part 24 shall not exceed 3.8 dBi**

**Prediction for Part 22:**

P Max power input to the antenna: 32.4 dBm / 1.862 W  
 R Distance: 20 cm  
 S MPE limit for uncontrolled exposure: 0.567 mW/cm<sup>2</sup>  
  
 G Antenna gain: 1.53 numerical  
 G Antenna gain: 1.84 dBi / -0.3 dBd

ERP power limit according to §22.913(a): 7 W

**Therefore the maximum antenna gain for part 22 shall not exceed -0.3 dBd**