

**CALCULATIONS  
used in determining  
POWER DENSITY mw/cm<sup>2</sup>**

**POWER DENSITY mw/cm<sup>2</sup> is reference used for  
determining the compliance of an intentional radiator to the  
Radio Frequency Radiation Exposure Limits  
as shown in section 1.1310 of the Rules and in  
ANSI/IEEE C95.1-1992**

**THE LIMIT FOR THE FREQUENCY OF 2.45 GHz  
OCE = 5 mw/cm<sup>2</sup>      GPUE = 1 mw/cm<sup>2</sup>**

**POWERdBm plus ANTENNA GAIN dB equals ERPdBm**

**POWER DENSITY using ERP**

$$\text{Field Strength (FS) v/m} = \frac{\sqrt{30 \times \text{ERP}_{\text{watts}}}}{3}$$

$$\frac{(\text{V/M})^2}{3770} = \text{PD mw/cm}^2$$

THE FOLLOWING PAGE HAS THE TWO SETS OF POWER DENSITY CALCULATIONS  
FOR THE BRIDGE RADIO AND THE TWO ANTENNAS , 16 dB & 21 dB GAIN.



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## POWER DENSITY using ERP

**16 dB gain antenna 'patch'**

Power out at TX antenna port was measured to be .043 watts or 43 milliwatts or 16 dBm (rounded off)

$$\text{ERP dBm} = 16 + 16 \text{ (power + gain)}$$

$$\text{ERP} = 32 \text{ dBm}$$

To use ERP in the field strength formula the reading has to be in watts.

$$32 \text{ dBm} = 1584.893 \text{ mw} = 1.584 \text{ watts} = 1.6 \text{ watts (rounded off)}$$

$$\text{FIELD STRENGTH V/M} = \frac{\sqrt{30\text{ERP}}}{R} = \frac{\sqrt{30 \times 1.6}}{3} = \frac{\sqrt{48}}{3} = \frac{6.928}{3} = 2.3$$

$$\text{POWER DENSITY mw/cm}^2 = \frac{(\text{V/M})^2}{3770} = \frac{(2.3)^2}{3770} = \frac{0.0014}{3770} \text{ mw/cm}^2 \text{ POWER DENSITY}$$

**21 dB gain antenna 'parabolic'**

same measured power as above

$$\text{ERPdBm} = 16 + 21 \text{ (power + gain)}$$

$$\text{ERP} = 37 \text{ dBm}$$

$$37 \text{ dBm} = 5011.872 \text{ mw} = 5.0 \text{ watts}$$

$$\text{FIELD STRENGTH V/M} = \frac{\sqrt{30\text{ERP}}}{R} = \frac{\sqrt{30 \times 5}}{3} = \frac{\sqrt{150}}{3} = \frac{12.247}{3} = 4.082 = 4$$

$$\text{POWER DENSITY mw/cm}^2 = \frac{(\text{V/M})^2}{3770} = \frac{(4)^2}{3770} = \frac{0.0042}{3770} \text{ mw/cm}^2 \text{ POWER DENSITY}$$



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