

## RF Exposures Evaluation

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

### LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time
(A) Limits for Occupational / Control Exposures				
300-1,500	--	--	F/300	6
1,500-100,000	--	--	5	6
(B) Limits for General Population / Uncontrol Exposures				
300-1,500	--	--	F/1500	6
1,500-100,000	--	--	1	30

### CALCULATIONS

$$E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$$

Given

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 re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

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

**LIMIT**

Power Density Limit,  $S=1.0\text{mW/cm}^2$

**TEST RESULTS**

Pass

Mode	Minimum separation distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density Limit ( $\text{mW/cm}^2$ )	Power Density at 20cm ( $\text{mW/cm}^2$ )
IEEE 802.11b	20	22.14	4	1.0	0.082

Remark : worst case is reported

Antenna numerical gain=2.512

Mode	Minimum separation distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density Limit ( $\text{mW/cm}^2$ )	Power Density at 20cm ( $\text{mW/cm}^2$ )
BLE	20	5.01	3	1.0	0.00126

Antenna numerical gain=1.995

$0.082+0.00126=0.08326<1$