



8.3 MAXIMUM PERMISSIBLE EXPOSURE

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 ²)	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

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

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 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:

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

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

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 / cm²

**LIMIT**

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

TEST RESULTS

No non-compliance noted.

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

$G=2.36\text{dBi}=1.72186857 \text{ mW}$

IEEE 802.11b = $0.0796 * 28.0543 * 1.72186857 \div 400 = 0.0096129$
 IEEE 802.11g = $0.0796 * 66.3743 * 1.72186857 \div 400 = 0.0227433$
 IEEE 802.11n HT20 = $0.0796 * 53.4564 * 1.72186857 \div 400 = 0.0183169$
 IEEE 802.11n HT40 = $0.0796 * 53.2108 * 1.72186857 \div 400 = 0.0182328$

Mode	Minimum separation distance (cm)	Output Power (dBm)	Output Power (mw)	Antenna Gain (dBi)	Power Density Limit (mW/cm^2)	Power Density at 20cm (mW/cm^2)
IEEE 802.11b	20	14.48	28.05	2.36	1.00	0.009613
IEEE 802.11g	20	18.22	66.37	2.36	1.00	0.022743
IEEE 802.11n HT20	20	17.28	53.46	2.36	1.00	0.018317
IEEE 802.11n HT40	20	17.26	53.21	2.36	1.00	0.018233

REMARK: For mobile or fixed location transmitters, the maximum power density is $1.0 \text{ mW}/\text{cm}^2$ even if the calculation indicates that the power density would be larger.