

RF Exposure calculations (Mobile device)

From §FCC 1.1310 table 1A, the maximum permissible RF exposure for an uncontrolled environment is 1mW/(cm*cm), where, (cm*cm) = square cm. The electric field generated for a 1mW/(cm*cm) exposure (S) is calculated as follows:

$$S = E^2/Z$$

where, S = Power density

E = Electric field

Z = Impedance

so, 1mW/(cm*cm) = 10 W/(m*m)

Z is 377 ohm of the impedance of free space, where E and H field are perpendicular.

Thus the Electric field to produce a 1mW/(cm*cm) exposure is:

$$E = (10 \times 377)^{1/2} = 61.4 \text{ V/m, which is equivalent to } 1\text{mW/(cm*cm)}$$

Maximum conducted peak output power is 18.87dBm and maximum antenna gain is 0 dBi. The maximum radiated output power resulted in 77.09 mW.

Using the relationship between electric field E, effective radiated power in watts P, and distance in meters D, the corresponding distance D to produce a 1mW/(cm*cm) is calculated in the following expression:

$$D = (P \times 30)^{1/2} / E = (77.09 \times 10 \times 30)^{1/2} / 61.4 = 2.48 \text{ cm}$$

where, P: maximum effective radiated power measured, 18.87 dBm (77.09 mW)

E: electric field equivalent to 1mW/(cm*cm), 61.4 V/m

Notice in Installation Manual:

While installing and operating this transmitter, the radio frequency exposure limit of 1mW/(cm*cm) may be exceeded at distances close to the transmitter. therefore, the user must maintain a minimum distance of 20 cm from the device at all time.

The table below identifies the distance where the 1mW/(cm*cm) exposure limits may be exceeded during continuous transmission using this device.

Peak output power		calculated RF Exposure Separation Distance(cm)	Minimum RF Exposure Separation Distance(cm)
dBm	mW		
18.87	77.09	2.48	20