



10. RF Exposure calculations

10.1 Base unit

From §FCC 1.1310 table 1A, the maximum permissible RF exposure for an uncontrolled environment is $1\text{mW}/(\text{cm}^2)$, where, $(\text{cm}^2) = \text{square cm}$. The electric field generated for a $1\text{mW}/(\text{cm}^2)$ exposure (S) is calculated as follows:

$$S = E^2/Z \quad \text{where, } S = \text{Power density}$$

$$E = \text{Electric field}$$

$$Z = \text{Impedance}$$

so, $1\text{mW}/(\text{cm}^2) = 10\text{ W}/(\text{m}^2)$

Z is 377 ohm of the impedance of free space, where E and H field are perpendicular. Thus the Electric field to produce a $1\text{mW}/(\text{cm}^2)$ exposure is:
 $E = (10 \times 377)^{1/2} = 61.4\text{ V/m}$, which is equivalent to $1\text{mW}/(\text{cm}^2)$

Maximum conducted peak output power is 20.93 dBm (Refer to Page 12 of test report) and maximum antenna gain is 0 dBi. The maximum radiated output power resulted in 123.88 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 $1\text{mW}/(\text{cm}^2)$ is calculated in the following expression:

$$D = (P \times 30)^{1/2} / E = (123.88 \times 10 \times 30)^{1/2} / 61.4 = 3.139\text{ m}$$

where, P: maximum effective radiated power measured, 20.93 dBm (123.88 mW)
 E: electric field equivalent to $1\text{mW}/(\text{cm}^2)$, 61.4 V/m

Notice in Installation guide (Installation guide.pdf):

While installing and operating this transmitter, the radio frequency exposure limit of $1\text{mW}/(\text{cm}^2)$ may be exceeded at distances close to the transmitter. therefore, the user must maintain a minimum distance of 4 cm from the device at all time.

The table below identifies the distance where the $1\text{mW}/(\text{cm}^2)$ 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	3.139	4
20.93	123.88		

Note: The RF exposure also stated in installation guide (installation guide.pdf)