



## 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)