



Intertek Testing Services

ETL SEMKO

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10. RF Exposure calculations

10.1 Base unit

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

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

E = Electric field

Z = Impedance

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

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

Thus the Electric field to produce a $1\text{mW}/(\text{cm}^*\text{cm})$ exposure is:

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

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 $1\text{mW}/(\text{cm}^*\text{cm})$ is calculated in the following expression:

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

where, P: maximum effective radiated power measured, 20.93 dBm (123.88 mW)

E: electric field equivalent to $1\text{mW}/(\text{cm}^*\text{cm})$, 61.4 V/m

Notice in Installation guide (Installation guide.pdf):

While installing and operating this transmitter, the radio frequency exposure limit of $1\text{mW}/(\text{cm}^*\text{cm})$ 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 $1\text{mW}/(\text{cm}^*\text{cm})$ 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		
20.93	123.88	3.139	4

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