# Power Density Calculation for Aclara LLB2013001

## 15.247(i) Maximum Permissible Exposure

The following calculations are provided to show a comparison to the Maximum Permissible Exposure (MPE) for the general population in an uncontrolled area even though the2009-010B2 MTU is categorically excluded from the necessity of a radio frequency exposure evaluation. The exclusion (2.1091) applies to Part 90 transmitters operating below 1.5 GHz with output below 1.5 Watts.

**Normal Field Operation of Model 2013001:**

Frequency Range: 450 MHz – 470 MHz
Transmit Power: 0.200 W (dipole equivalent power)
Transmission Length: 60 mSec.
Transmission Period: One transmission every 6 hours

**Extreme Values Used for the Calculation:**

Transmit Power: 0.200 W (dipole equivalent power)
Transmission Length: 100 mSec.
Transmission Period: Four transmissions every hour

**Average Power Calculation:**

RF exposure for the general population in uncontrolled areas is determined using transmitted power averaged over 30 minutes. The equation used in the calculation is:

$$\mathbf{P}avg = P \times Tx \times TL/t$$

Where **P**avg is the average power, P is measured power output (mW), Tx is the number of transmission in 30 seconds, TL is the transmission length (Sec) and t is the number of seconds in 30 minutes. Therefore:

$$\mathbf{P}avg = 200\ mW \times 3 \times 0.10\ Sec/30\ min \times 60\ sec/min$$

$$= 184.8\ mW\text{-}Sec/1800\ Sec = 0.033\ mW$$

**Average Power Density Calculation:**

Average power density is calculated at a distance of 20 cm by using the following equation:

$$S = \mathbf{P}avg \times G/4 \times \pi \times r^2$$

where S is the average power density, **P**avg is the average power, G is the gain of a dipole antenna and r is the distance from the transmitter. Therefore:

$$S = 0.033\ mW \times 1.64/4 \times 3.1416 \times 20cm \times 20cm$$

$$= 0.05412\ mw/5027\ cm^2 = 0.0107\ uW/cm^2$$

**Comparison of 2009-010B2 to MPE:**

The MPE for the general population in uncontrolled areas is $460/1500 = 0.3067\ mW/cm^2$

The average power density of the LLB2013001 MTU is $0.0107\ uW/cm^2$, which is almost 10,000 times lower than the MPE of $0.3067\ mW/cm^2$.