December 21, 2014

RF Exposure calculation

Based on FCC 1.1307 & 2.1091, FCC OET Bulletin 65

1. Categorically Exclusion from exposure Evaluation:

According to FCC regulation, RF exposure evaluation is Categorically Excluded if transmitter's operation frequency is less than 1.5GHz and ERP is less than 1.5W.

2. The specification of LCU transmitter:
   - Operational frequency band **450MHz to 470MHz**
   - The LCU transmitter is measured for **MAX RF Power 4W**
   - **Maximum transmission time(duration)** for any LCU NEMA transmitters does not exceed **150mSec**
   - Transmission period-absolute maximum is **1 transmission per 30 minutes.**
   - LCU transmitters utilize 4GFSK modulation**.**
3. Average RF Power Calculation

FCC regulation on permissible RF exposure are not based on the peak envelope power, but on average power (P_ave) over a 30-minute time period for uncontrolled environments.

As mentioned in (2), during any 30 minutes LCU can transmit 1 time. Duration is 150 mSec.

With maximum RF radiation equal to 4W, the average RF Power over 30 minutes is:

P_ave(worst case) at 30 minute=4×150x10^(-3)=600mW

4. Maximum radiated Power Density prediction (**S**):

The predict power density (**S**) at distance **R=20cm** from transmitter with **P_ave** =600mW, next formula is used:

S=P_ave/(4×π× R^2)

S =600mW/(4× π ×20cm×20cm)=0.119mW/ cm^2

5. Maximum Permissible Exposure (MPE) from LCU

As FCC require, the maximum permissible exposure for general public in "uncontrolled situation" at 20cm is:

MPE=frequency[MHz]/1500=460MHz/1500=0.307mW/cm^2

Compare results in (4) and (5),

S=0.119mW/ cm^2<MPE=0.307mW/cm^2

We see that LCU is fully complies with RF safety at a distance 20cm.