VANTAGE

legrand

RF Exposure/Environmental Evaluation

The device CC-RLINT (FCC ID: PII-CCRL) being submitted by Vantage Controls is a thermostat interface that incorporates a low power frequency hopping spread spectrum transceiver. It operates in the 902-928 MHz ISM band. It has a monopole type antenna extended from the PCB. The following calculations determine the minimum separation between the user and the antenna to meet the requirements for Maximum Permissible Exposure (MPE) outlined in CFR 47 Section 1.310.

CFR 47 Section 1.310 specifies (A) Limits for Occupational/Controlled Exposures and (B) Limits for General Population/Uncontrolled Exposure. The limits in (B) are the most stringent, so these are what we will use in our calculation.

From CFR 47 Section 1.310 Table 1 (B):

For 300-1500 MHz the limit is given in mW/cm^2 and is calculated from the following equation: *Frequency/1500*

For our frequency range (902-928 MHz) the worst case limit comes out to **0.6mW/cm^2**.

The MPE distance will be calculated for the worst case of a 100% transmitter duty cycle, transmitter power of 16dBm (39.8mW), and 2.1dBi (1.6) antenna gain.

For an isotropic radiator, the surface area of a sphere can be used to determine the area over which the transceiver energy is radiated.

$$Surface\ area\ of\ a\ sphere = 4*\pi*radius^2$$

In the case where there is an antenna gain, the worst-case energy density is increased by the antenna gain. In this case, the exposure level can be calculated as follows:

$$Exposure\ Level(mw/cm^2) = (P*C*G)/(4*\pi*D^2)$$

P (Transmitter output power) = 39.8mW
G (Antenna Gain) = 1.6
D (Distance) = 20cm
C (Duty Cycle) = 1

For our transmitter:

$$Exposure\ Level(mw/cm^2) = (39.8*1*1.6)/(4*\pi*20^2) = \mathbf{0.0127mW/cm^2}$$

This is less than the limit of $0.6mW/cm^2$. Therefore, the Vantage CC-RLINT (FCC ID: PII-CCRL) complies with the FCC RF Exposure/Environmental Evaluation requirements.

It should be noted that the above calculations are based on absolute worst-case scenarios that will rarely occur in normal use. This is a Time-Division-Duplex system, so the transmitter duty cycle will never be 100.