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To Whom It May Concern:

To investigate the RF exposure of the Tantalus Systems Corp. TC 1116/1216 series controller the FCC OET Bulletin 65 and the Health Canada Safety Code 6 (as specified in RSS-102) have been used as guidelines to determine compliance with the FCC and IC RF exposure limit.

In addition the FCC has allowed to omit the 20 cm grant note and user manual statement specifically for utility meters if the source-based time-averaged output powers are below the July 17, 2002 TCB Exclusion List footnote 3 General Population, for a distance greater than or equal to 2.5 cm threshold levels.

Analysis:

As per OET Bulletin 65 and Health Canada Safety Code 6 guidelines:

The EUT is classed to meet the RF exposure that it subjects to the “General Population/Uncontrolled Environment”. Under this class the limit is calculated by:

$$S = f/1500$$

Where S is the Power Density in mW/cm^2 .

F is the frequency of operation in MHz.

The EUT operates in the 902 to 928 MHz band, the lower exposure limit would be obtained by using a frequency at the lower edge of the band, therefore:

$$S = 902 / 1500 = 0.601 \text{ mW}/\text{cm}^2$$

The maximum EIRP was measured to be 0.328W

However, under normal operation the transmitter is not on continuously and therefore its power must be time averaged. As indicated in the theory of operation the maximum total transmit cycle will be 10.7%.

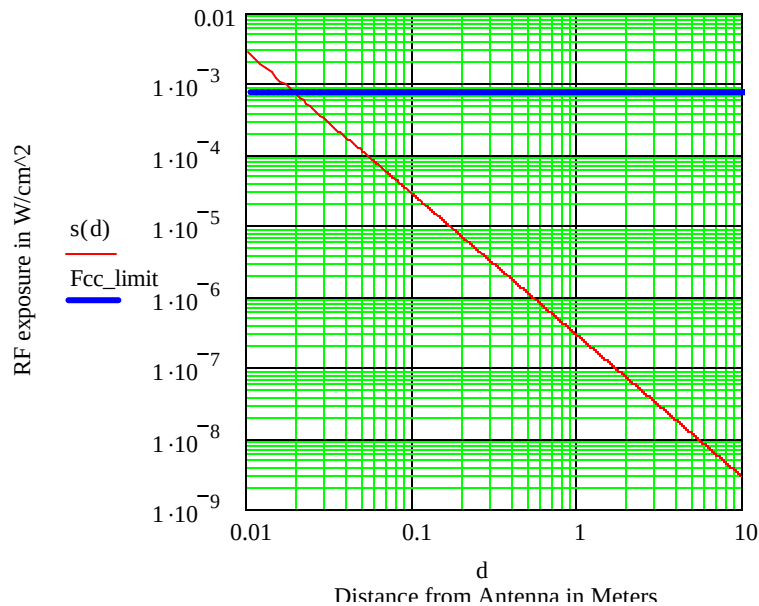
The average EIRP is therefore:

$$\begin{aligned} \text{EIRP}_{(\text{average})} &= \text{EIRP}_{(\text{continuous})} * \text{duty cycle} \\ \text{EIRP}_{(\text{average})} &= 0.328 \text{ W} * 0.107 = 0.0351 \text{ W} \end{aligned}$$

The predicted power density at a distance d, in the same horizontal plane as the elevation of the antenna is calculated and graphed below:

$$\begin{aligned} \text{Eirp} &:= 0.328 \quad \text{Duty_cycle} := 0.107 \quad \text{Eirp_avg} := \text{Eirp} \cdot \text{Duty_cycle} \quad \text{Freq_Mhz} := 902 \\ d &:= 0.01, 0.011 \dots 10 \quad (\text{Distance in meters}) \quad \text{Fcc_limit} := \frac{\text{Freq_Mhz}}{1500 \cdot 1000} \quad (\text{Fcc Limit in W / cm}^2) \end{aligned}$$

$$s(d) := \frac{\text{Eirp_avg}}{4 \cdot \pi \cdot (d \cdot 100)^2} \quad (\text{Power in W / cm}^2)$$



The EUT is normally operated and housed within an electromechanical utility meter. From the predicted exposure levels graphed above the distance away from the EUT antenna where the RF exposure limit is exceeded is required to be less than 3 cm. Typically occupants of the building in which the EUT is installed are many times farther than 3 cm from the EUT and therefore typical exposures occur at distances greater than one meter. At one meter the predicted power density is 0.310 uW/cm² or 0.05% of the allowable FCC exposure limit.

As per TCB Exclusion List, Footnote 3, General Population $\geq$ 2.5 cm:

Specifically for telemetry utility meters, the maximum time averaged source based output power must be below the following in order to allow omission of the 20 cm note and statement on a TCB Grant of Equipment Authorization and EUT user manual respectively.

$$\begin{aligned} &120/f_{(\text{GHz})} \text{ mW} \\ &\text{or} \\ &120/0.928 = 129 \text{ mW} \end{aligned}$$

As in the previous analysis the maximum time averaged sourced based output power is 35.1mW and represents 27% of the limit.

Result:

The EUT does not expose the public to radio frequency energy levels in excess of the FCC guidelines. The following statement is **not required** on a TCB Grant of Equipment Authorization or in the EUT user manual:

“The antenna used for this transmitter must be fixed-mounted in a permanent structure providing a separation distance of at least 20 cm from all persons during normal operation.”



Mark Fairburn
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