Jan 12, 2013

To Whom It May Concern:

To investigate the RF exposure of the Tantalus Systems Corp. TC-1120/1220 series communication module 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 omitting SAR evaluation if the source-based time-averaged output powers are below the levels defined in the KDB publication 447487 D01 General RF Exposure Guidance v05.

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:

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

The maximum EIRP was measured to be 0.871W

However, under normal operation the transmitter is not on continuously and therefore its power must be time averaged. The maximum total transmit cycle is 5.8%.

The average EIRP is therefore:

$$EIRP_{(average)} = EIRP_{(continuous)} * \text{duty cycle}$$
$$EIRP_{(average)} = 0.871 \text{ W} * 0.058 = 0.0505 \text{ W}$$

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

$Eirp := 0.871$ $Duty\_cycle := 0.058$ $Eirp\_avg := Eirp \cdot Duty\_cycle$ $Freq\_Mhz := 902$

$d := 0.01, 0.011 .. 10$ (Distance in meters) $Fcc\_limit := \dfrac{Freq\_Mhz}{1500 \cdot 1000}$ (Fcc Limit in W /cm ^{2})

$$s(d) := \frac{Eirp\_avg}{4 \cdot \pi \cdot (d \cdot 100)^2} \quad \text{(Power in W / cm}^2\text{)}$$
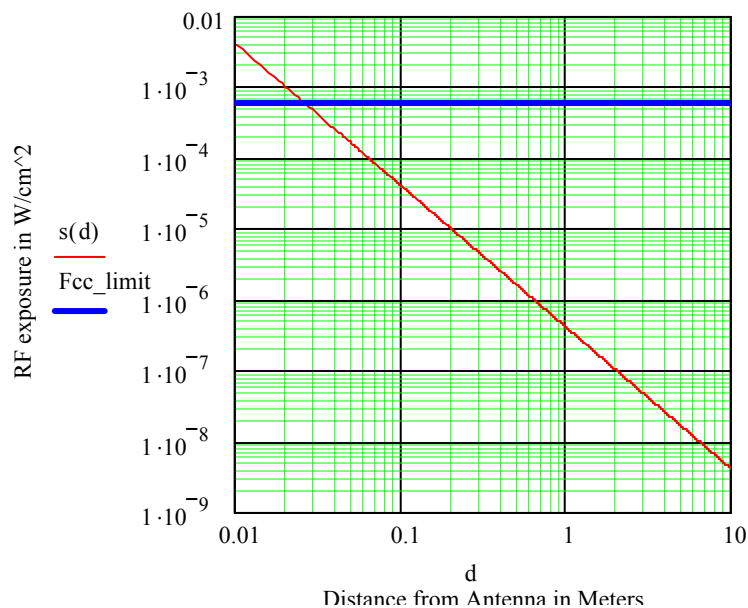
From the graph, it can be observed that the distance at which the RF exposure would exceed the limit would be 2.6cm. The EUT is normally operated and housed within an electromechanical utility meter. If a human was to place his head touching the cover of the meter the distance from the internal antenna would be 30mm. In general this situation would never happen since to read the information on the meter a person/operator would normally be about 30cm away from the device. Typically occupants of the building in which the EUT is installed are many times farther than 2.6cm and since the meter is installed on the exterior part of the dwelling then the radiated energy is attenuated as it propagates through the building. Therefore typical exposures occur at distances greater than one meter. At one meter the predicted power density is 0.450 uW/cm^2 or 0.08% of the allowable FCC exposure limit.

As per the FCC KDB publication 447487 D01 General RF Exposure Guidance v05, SAR tests are not required if the RF power does not exceed the following formula:-

$$(f_{(GHz)})^{0.5} \text{ x Time averaged power (mW) /distance(mm)} \leq 3.0$$

or

$$(0.928)^{0.5} \text{ x Time averaged power (mW) /distance(mm)} \leq 3.0$$

As in the previous analysis the maximum time averaged sourced based output power is 50.5mW and the closest distance from the antenna to any body part is 30mm, this yields a numeric value of 1.62 which is 54% 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."

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