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To Whom It May Concern:

To investigate the RF exposure of the Tantalus Systems Corp. LM-1500 demand response modules (FCC ID: OZFDCNIC1) 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 447498 D01 General RF Exposure Guidance v05r02.

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:

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

The maximum EIRP was measured to be 27.9mW

From the submitted time of occupancy plots it can be determined that the However the maximum total transmit bandwidth available on a time averaged basis is 27.5%.

The average EIRP is therefore:

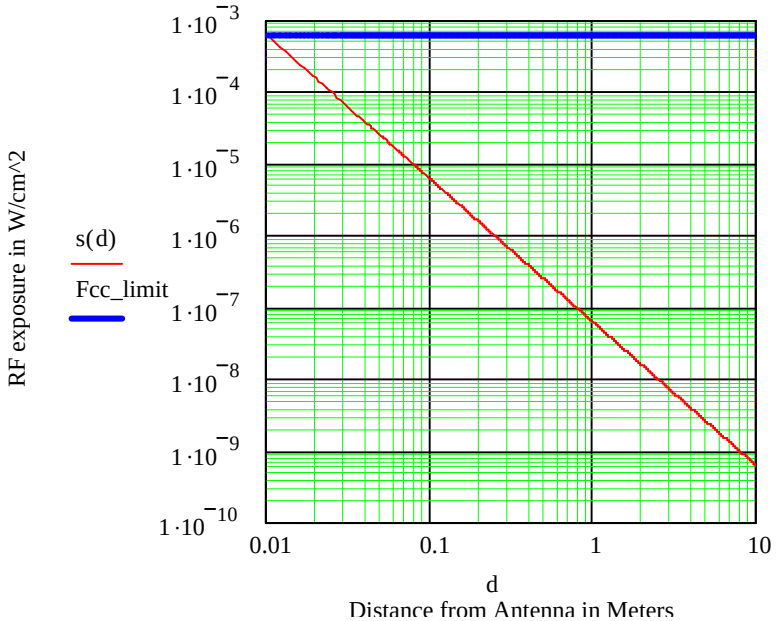
$EIRP_{(average)} = EIRP_{(continuous)} * \text{duty cycle}$
$EIRP_{(average)} = 27.9mW * 0.275 = 7.7mW$

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

$Eirp := 0.0279 \quad Duty\_cycle := 0.275 \quad Eirp\_avg := Eirp \cdot Duty\_cycle \quad Freq\_Mhz := 902$

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

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



From the graph, it can be observed that the distance at which the RF exposure would exceed the limit would be approx. 1mm. The far field distance for a small antenna is given by any distance greater than lambda/(2*pi); this equates to a minimum distance of 5.3cm, therefore this calculation is not valid and so the minimum distance must be 5.3cm in which the far field calculations become valid.

As per the FCC KDB publication 447498 D01 General RF Exposure Guidance v05r02, SAR tests are not required if the RF power does not exceed the following formula:-

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

or

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

As in the previous analysis the maximum time averaged sourced based output power is 7.7mW and the closest distance from the antenna to any body part must be 2.2mm, to satisfy the limit.

For this product, the antenna is internal to the product and the closest that a person could get to the antenna would be 2cm, therefore this product will meet the General RF Exposure guidance ***irrespective*** of how close a person is to the product.

Result:

The following statement must be inserted into the manual:

"The antenna used for this transmitter must be fixed-mounted in a permanent structure providing a separation distance of at least 2.2 mm from all persons during normal operation."

Mark Fairburn
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