TRANSCORE

Amtech Technology Center
8600 Jefferson Street NE
Albuquerque, New Mexico 87113
505.856.8000 tel 505.857.0715 fax

To: Gregory Czumak (Review Engineer)
American Certification Body Inc.

From: Michal P. Gonzales (Analog/RF/DSP Design Engineer)
TransCore-Amtech Technology Center

CC: Les Payne (Senior Compliance Engineer)
DNB Engineering, Inc.

Date: Thursday, November 14, 2016

Subject: Response to American Certification Body Inc. Memo dated 11/8/16 Item 10-11.

After reviewing the question and then our manual which has the maximum permissible exposure (MPE) information it was found that the limits reported in the manual and subsequently used by the DNB were incorrect. We have corrected those numbers. Included with this response is the MPE calculator that we used to determine the given numbers.

The MPE calculator is used to find the minimum distance for each of the agency's (FCC, IC, and OSHA) that is applicable for this equipment. Too ensure that the maximum safety factor is presented to our customers we have margin added to the final numbers. The first we assume that there is no cable loss between the MPRX interrogator (reader), next we also round up the minimum calculated distance.

The calculation used is based on the field strength equation (see eq 1). Equation 1 is the Power density (S) in mW/cm^2., where Pd is the radiated power in (EIRP) Watts and r is the distance (cm) from the radiation point.

$$S = \frac{P_d}{4 \cdot \pi \cdot r^2} \quad \text{eq 1}$$

Solving for the distance from the radiation point based on a fixed power density we get eq 2

$$r = \frac{\sqrt{P_d}}{2 \cdot \sqrt{\pi} \cdot \sqrt{S}} \quad \text{eq 2}$$

Given eq 2 if we know the power density required and the radiated power we can find the distance required to meet both the power density and radiated power. The example 1 is based on the FCC occupational limit (at 902 MHz) and given a transmitter output of 1.6Watts into a 13.85dBi gain antenna with no cable loss.

$$P_{d\_dBm} := 32.04\,dBm + 13.85\,dBi$$

$$P_{d\_dBm} = 45.89\,dBm$$

$$P_d := 38370.725 \cdot mW \qquad S := 3.01 \cdot \frac{mW}{cm^2}$$

$$r := \frac{\sqrt{P_d}}{2 \cdot \sqrt{\pi} \cdot \sqrt{S}}$$

$$r = 31.85\,cm$$

Example 1

As the example 1 shows is that the distance required is 31.85cm, in the MPE calculator we round up this number to 32cm. Our final statement is that we recommend the safest distance be adhered to (i.e. being the IC limits) to all of our customers. If you have any further questions, please contact me at any time.

Michael P. Gonzales
Analog/RF/DSP Design Engineer
TransCore – Amtech Technology Center
Albuquerque, NM 87113
Ph:505-856-8022
Fax:505-857-0715
Email:Michael.Gonzales@TransCore.com

Attachments:

Human exposure calculator.xlsx