FCC Requirements for RF Radiation

General

Based on FCC rule 2.1091 and the FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, OET Bulletin 65 including Supplement C, all integrators of the RIM OEM unit are subject to routine environmental evaluation for radio frequency (RF) exposure prior to equipment authorization or use.

For mobile devices that operate at frequencies of 1.5 GHz or below and whose Effective Radiated Power (ERP) is 1.5 watts or more are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use. Although the ERP is well below 1.5 watts (as shown below), the evaluation for RF exposure was performed.

The ICU is classified by the FCC as a mobile device. This classification identifies the ICU as a transmitting device designed to be used such that a separation distance of at least 20 cm is maintained between the body of the user and the antenna. For a mobile device the human exposure to the RF radiation can be evaluated in terms of Maximum Permissible Exposure (MPE) limits for power density in mW/cm^2. Since the ICU transmits randomly with respect to the vehicle operator (that is, it is not controlled by the technician), the FCC defines this as an Uncontrolled Environment. The MPE limit at 900 MHz for an Uncontrolled Environment is 0.6 mW/cm^2.

Analysis

The following data is used to calculate the ERP and the MPE of the vehicle system for the FCC specified 30 minute interval:

RIM 902M Transmit Power = 2 watts = 3 dBW
Antenna Gain = 4 dBd
Cable and Connector Loss = 3 dB
Duty Cycle (Worst Case) = See below

For our worst-case (1) analysis, we assumed the vehicle was out of BSWD coverage for 5 days and had accumulated 1500 events to report. We assumed it drove into BSWD coverage at 60 MPH, with the default reporting parameters of 800 meters or 5 minutes set. In this case the duty cycle is 10.75% for 30 minutes. Our second analysis (2), was based on a bucket truck, with the default parameters set, which remains stationary for 30 minutes. In this case, the technician can be outside the vehicle cab, potentially working near the BSWD antenna. The duty cycle is 0.29% for 30 minutes.

ERP = (Transmit Power + Antenna Gain – Cable Loss) x Duty Cycle

$ERP_1 = (3 + 4 − 3)(0.1075) = 4$ dBW x $0.1075 = 0.270$ Watts

$ERP_2 = (3 + 4 − 3)(0.0028) = 4$ dBW x $0.0029 = 0.007$ Watts

Power at the antenna = (Transmit Power − Cable Loss) x Duty Cycle

$P_{ant(1)} = (3 − 3)(0.1075) = 0$ dBW x $0.1075 = 0.1075$ Watts

$P_{ant(2)} = (3 − 3)(0.0028) = 0$ dBW x $0.0029 = 0.0029$ Watts

Using the MPE calculator at http://n5xu.ae.utexas.edu/rfsafety/ , the distances corresponding to an MPE of 0.6 mW/cm^2 can be calculated.

For the worst case 1, a person would be required to remain more than 5.3 inches from the antenna. For case 2, a person would be required to remain more than 1 inch from the antenna. Therefore, in both cases, the FCC-mandated minimum of 20 cm (approximately 7.9 inches) will be recommended.

This information will be included in the technician training, user and installation documentation associated with the equipment. These actions are considered adequate to meet the safety criteria as outlined in FCC OET Bulletin 65.