

Info

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To	TUV SUD Canada Inc		

MRFM-S Plus – Model 802870 MPE

References: FCC ID: JQU802870
IC: 2665A-802870
RSS-102, Issue 5, March 2021
OET Bulletin 65, Edition 97
447498 D01 General RF Exposure Guidance v06
802870 User Manual

The model 802870 is MPE test/evaluation exempt, as shown by calculation herein.

The unit is professionally installed in accordance with maximum permitted ERP for a site. As defined by user manual, the maximum power at the antenna is restricted when operating. The instructions for the installer for setting up the lane are:

The power output of a module at ambient ($P_{out(amb)}$) shall be constrained using internal or external Tx attenuation so that the following is satisfied:

$$P_{out(amb)} \leq 43.77 \text{ dBd} - G_{fund};$$

Where G_{fund} is the net gain from antenna connector on the RF module to the antenna radiated signal. The antenna gain is expressed in **dBd**.

These instructions define the limits on power setting into the antenna system (antenna plus cables) so that over temperature the ERP will not exceed 44.77dBm.

The installer must also declare the operational ERP of the system in which this module is used for the FCC or ISED Canada Site Licence.

In this case the maximum power allowable at the antenna input (typical antenna gain 15dBi = 12.85dBd +2.15dB) will be:

$$43.77\text{dBm} - 12.85\text{dBd} = 30.92 \text{ dBm}$$

In addition, the distance used for calculations is 100 cm, as this is the minimum distance an operator will be from the EUT during normal operation as required in the User Manual.

The following statements are included in the User Manual:

Note: IEC 60950-1 and/or EN60950-1, First Edition, Information Technology Equipment – Safety – Part 1: General Requirements require that this equipment must be located in a RESTRICTED ACCESS LOCATION (RAL). Only authorized personnel can have access to the equipment.

“Keep at least 100 cm away from the radiating face of the antenna when the RF module is connected and operating.” This statement is found on page 19 of the User Manual.

The antenna height stated in the User Manual is 16 ft, and since these are placed over roadways in toll facilities, no general public can get within a few meters of them. Therefore they are in a controlled environment and no operator will be less than 100 cm from the antenna.

Prediction of MPE limit at a given distance

Equation from page 20 of OET Bulletin 65, Edition 97-01

Equations for Predicting RF Fields

Calculations can be made to predict RF field strength and power density levels around typical RF sources. For example, in the case of a single radiating antenna, a prediction for power density in the far-field of the antenna can be made by use of the general Equations (3) or (4) below [for conversion to electric or magnetic field strength see Equation (1) in Section 1]. These equations are generally accurate in the far-field of an antenna but will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction.

$$S = \frac{PG}{4\pi R^2} \quad (3)$$

where: S = power density (in appropriate units, e.g. mW/cm²)
 P = power input to the antenna (in appropriate units, e.g., mW)
 G = power gain of the antenna in the direction of interest relative to an isotropic radiator
 R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

or:

$$S = \frac{EIRP}{4\pi R^2} \quad (4)$$

where: EIRP = equivalent (or effective) isotropically radiated power

Maximum allowable peak output power at antenna input terminal: 43.77dBm - 12.85dBd = 30.92 dBm

Maximum allowable peak output power at antenna input terminal: 1235.9474(mW)

Antenna gain(typical): 15(dBi)*(12.85 dBd + 2.15 = 15 dBi)

Maximum antenna gain:31.6227(numeric)

Time Averaging:100(%)

Prediction distance:100(cm)

Prediction frequency: 915.75(MHz)

Power density at prediction frequency: 0.31117 (mW/cm²)

This equates to 3.1117 W/m²

Limit for controlled exposure at prediction frequency: 19.5337 (W/m²) from RSS-102, Issue 5, March 2021, p.12, Table 6

Power density at prediction frequency: $3.1117 \text{ (W/m}^2\text{)} < 19.5337 \text{ W/m}^2$ PASS

For information: This equates to 34.25 V/m

In addition, the uncontrolled exposure limits are met at a distance of 110cm and no general public will be within that distance.

The units are therefore MPE test/evaluation exempt.