

Section 9. Maximum Permissible Exposure

MPE estimate is given per 2.1091 of FCC Rules:

Given

$$E = \sqrt{30 * P * G} / d$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{(30 * P * G) / (3770 * S)}$$

Changing to units of Power to mW and Distance to cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

yields

$$d = 100 * \sqrt{(30 * (P / 1000) * G) / (3770 * S)}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW/cm²

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

$$d = 0.282 * 10^{((P + G) / 20)} / \sqrt{S} \quad \text{Equation (1)}$$

$$S = 0.0796 * 10^{((P + G) / 10)} / d^2 \quad \text{Equation (2)}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW/cm²

Equation (1) and the measured peak power is used to calculate the MPE distance.

Equation (2) and the measured peak power is used to calculate the Power density.

Limit:

S=1.0 mW/cm² for public (un-controlled environment)*.

S=5.0 mW/cm² for professional (controlled environment)

*1mW/ cm² is the reference level for general public exposure according to the OET Bulletin 65, Edition 97-01 Table 1.

Results:

This EUT shall comply with RF exposure requirements stated in FCC KDB865664 section 2. and KDB447498 section 7.

For this product, typical max. gain of antenna $G=2.6\text{dBi}$, with $P=37\text{dBm}$, using formula (1) or (2),

Minimum MPE distance while $S=1\text{mW}/\text{cm}^2$, $d=26.93\text{ cm}$. $S=5\text{mW}/\text{cm}^2$, $d=12\text{cm}$.

The intended and expected application for this product is for installation in an unmanned ground vehicle.

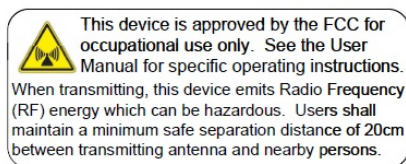
For mobile device, minimum $d=20\text{cm}$, per formula (2), $S=1.825\text{mW}/\text{cm}^2$. This will meet the requirement for professional / controlled environment application.

The following information shall be included in user manual:

By FCC definition, a mobile transmitter installation requires a minimum safe separation distance of 20cm between a transmitting antenna and any person. The 25VST-AMP has been designed to comply with FCC RF exposure regulations for occupational/controlled-environment conditions at this separation distance when an antenna with gain not exceeding 2.5dBi is installed. This is the maximum antenna gain that can be used consistent with the approval granted to this device. Higher gain antennas shall not be used, and users shall verify that the proper antenna has been installed before commencing transmitter operation. The antenna used for this transmitter must be installed to provide a separation distance of 20cm from all persons, and must not transmit simultaneously with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures. In the event that the transmitter is not visible to the user when installed, a warning label requiring this separation distance shall be placed in a prominent and visible location adjacent to the transmitting antenna. Please contact IMT to procure additional labels if needed.

As noted above, this device is intended for use only by trained occupational/professional staff and only in a work-related use condition. Users of this device shall be made fully aware that the transmitter produces RF energy, and shall be able to exercise control over their exposure to RF energy from this device. RF Exposure allowable limits are higher in occupational/controlled-environment conditions as a result of the foregoing conditions. Consequently, the foregoing awareness and control conditions shall be strictly maintained.

The RF Exposure compliance label shall be affixed to EUT:



NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.