

Calculation: RF-Exposure for 80 GHz tank level probing radar

Type identification: **FMR43**

The EUT will be fixed mounted inside a steel tank and has to fulfil the emission requirements according to 47 CFR §15.209 (a). Because of the tank installation the distance to the user could be regarded as larger than 20 cm.

The maximum allowed emission of EUTs operation frequency is 500 µV/m measured in 3 m distance according to 47 CFR §15.209 (a).

According to ANSI C63.10-2020 Annex G.2 this maximum allowed field strength could be converted to an ERP value with the following formula:

$$ERP = \frac{EIRP}{1.64} = \frac{(E \times d)^2}{(30 \times 1.64)} = \frac{(E \times d)^2}{49.2} = \frac{(500 \times 10^{-6} \times 3)^2}{49.2} = 4.57 \times 10^{-8} \text{ W}$$

According to 47 CFR §1.1307 (b)(3)(i)(C) the following formulas for the device operating frequency of 80 GHz (frequency range 1.5 GHz to 100 GHz) and a minimum EUT/user distance (R) of 20 cm were used:

- According to 47 CFR §1.1307 (b)(3)(i)(C) with $f = 80 \text{ GHz}$ $= \frac{\lambda}{2\pi} = \frac{\frac{3 \times 10^8 \text{ m}}{\text{s}}}{2\pi \times 80 \text{ GHz}} = 0.0006 \text{ m}$
- $ERP \text{ Limit} = 19.2 \times R^2 = 19.2 \times (0.2)^2 = 0.768 \text{ W}$

As these calculations are showing, according to 47 CFR §1.1307 (b)(3)(i)(C) the FMR43 qualifies at 0.2 m separation distance between the user and the EUT for MPE based exemption.