

RF Exposure Analysis – Minimum Separation Distance for the Vega Grieshaber VEGAPULS 6X, Level Probing Radar and Tank Level Probing Radar

FCC ID: O6QPS6XW

The level probing radar operates in the 76GHz to 84GHz band.

The following FCC Rule Parts are applicable:

Part 2.1091 - Radiofrequency radiation exposure evaluation: Mobile devices

Part 1.1307(b)(3)(i)(C) - SAR test exemption (ii)

VEGAPULS 6x Maximum Transmit Power Consideration:

The VEGAPULS 6X has four different antenna types:

Plastic Horn Antenna

Flange with Lens Antenna

Threaded Antenna

Flange with Encapsulated Antenna

Each antenna has a maximum gain.

The maximum conducted output power is set to -0.2dBm (including tune-up tolerance).

Plastic Horn Antenna

Antenna Gain: +34.2dBi

$EIRP = -0.2dBm + 34.2dBi = +34.0dBm$

$ERP = EIRP - 2.15dBm = 31.85 dBm (1.53 W)$

Flange with Lens Antenna

Antenna Gain: +25.3dBi

$EIRP = -0.2dBm + 25.3dBi = +25.1dBm$

$ERP = EIRP - 2.15dBm = 22.95 dBm (0.197 W)$

Threaded Antenna

Antenna Gain: +30.7dBi

$EIRP = -0.2dBm + 30.7dBi = +30.5dBm$

$ERP = EIRP - 2.15dBm = 28.35 dBm (0.684 W)$

Flange with Encapsulated Antenna

Antenna Gain: +33.4dBi

$EIRP = -0.2dBm + 33.4dBi = +33.2dBm$

$ERP = EIRP - 2.15dBm = 31.05 dBm (1.274 W)$

Evaluation

From Part 2.1093(c)(1). RF exemption applies if the maximum transmitted power is less than the maximum of the following criteria:

- i) Less than 1 mw Blanket exemption. $P_{TH} = 0.001 \text{ W}$
(VEGAPULS 6X is not compliant)
- ii) Determination of exemption under the MPE-based §1.1307(b)(3)(i)(C),

Determination of threshold power (P_{TH}) under the MPE-based §1.1307(b)(3)(i)(C) exemption.

This is only applicable at a separation distance greater than $\lambda/2\pi$

For the VEGAPULS 6X

80GHz operation $\Rightarrow \lambda/2\pi = 0.0006\text{m} (0.06\text{cm})$

The VEGAPULS 6X will need to have a separation distance greater than 0.06cm for this clause to be applicable for demonstrating exemption in accordance with §1.1307(b)(3)(i)(C)

To demonstrate this, the applicable equation in Table 1 of §1.1307(b)(3)(i)(C) will need to be re-arranged for the minimum separation distance (R).

$$\text{Threshold ERP (watts)} P_{TH(1,500 - 100,000\text{MHz})} = 19.2 * R^2$$

$$R^2 = \text{Threshold ERP (watts)} P_{TH} / 19.2$$

$$R = (\text{Threshold ERP (watts)} P_{TH} / 19.2)^{1/2}$$

Calculations**Plastic Horn Antenna**

$$P_{TH} = 1.53 \text{ W}$$

$$R = (1.53 / 19.2)^{1/2}$$

$$R = 0.282\text{m} \text{ (28.2cm)}$$

$$P_{TH} = 0.197 \text{ W}$$

$$R = (0.197 / 19.2)^{1/2}$$

$$R = 0.101\text{m} \text{ (10.1cm)}$$

Threaded Antenna

$$P_{TH} = 0.684 \text{ W}$$

$$R = (0.684 / 19.2)^{1/2}$$

$$R = 0.282\text{m} \text{ (18.9cm)}$$

Flange with Encapsulated Antenna

$$P_{TH} = 1.274 \text{ W}$$

$$R = (1.274 / 19.2)^{1/2}$$

$$R = 0.469\text{m} \text{ (25.6cm)}$$

Conclusion:

The VEGAPULS 6X will be exempt from routine environmental (RF exposure) evaluation providing the VEGAPULS 6X is installed with a separation distance of 28cm to comply with FCC rule part §1.1307(b)(3)(i)(C):

Yours faithfully,



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