

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 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)

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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 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

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

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 $\S1.1307(b)(3)(i)(C)$ will need to be re-arranged for the minimum separation distance (R).

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

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

Calculations

Plastic Horn Antenna

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

 $R = (1.53 / 19.2)^{1/2}$
 $R = 0.282 \text{m} (28.2 \text{cm})$

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

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

$$R = 0.101m (10.1cm)$$

Threaded Antenna

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

$$R = (0.0684 / 19.2)^{\frac{1}{2}}$$

$$R = 0.282m (18.9cm)$$

Flange with Encapsulated Antenna

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

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

$$R = 0.469m (25.6cm)$$

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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Product Compliance & QM Product Safety Engineer

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