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RF Exposure Considerations for the VEGAPULS 42

FCC ID: O6QPS40W

The VEGAPULS 42 operates at 2402-2480 MHz (Bluetooth LE) and 75-85 GHz (Tank Level Probing Radar). The transmitters can transmit simultaneously.

The FCC requires that the calculated MPE be equal to or less than a given limit dependent on frequency at a distance of 20 cm from a device to the body of a user.

The following FCC Rule Parts and procedures are applicable:

Part 1.1310 – Radiofrequency radiation exposure limits

Part 2.1091 – Radiofrequency radiation exposure evaluation: mobile devices

KDB447498 D01 v06

Mobile and Portable Devices RF Exposure Procedures and Equipment Authorisation Policies

VEGAPULS 42 MAXIMUM TRANSMITTER POWER CONSIDERATIONS

75-85 GHz:

Tx Power: EIRP = -50.4dBm (maximum measured output power).

2402-2480 MHz:

Tx Power: 4.0 dBm +/- 1.0 dBm (conducted)

Antenna gain: -2.0 dBi

EIRP = 4.0 dBm + 1.0 dBm – 2.0 dBi = 3.0 dBm

MPE CALCULATIONS

The MPE calculation to calculate the safe operating distance for the user is.

$$S = \text{EIRP} / 4 \pi R^2$$

Where S = Power density
 EIRP = Effective Isotropic Radiated Power
 R = distance to the centre of radiation of the antenna (safe operating distance)

For 75-85 GHz:

Values:

EIRP = -50.4 dBm
 = 9×10^{-6} mW
R = 20cm

Power Density Requirement

From table 1 (e) - Limits for General Population/ Uncontrolled Exposure of
FCC Rule Part 1.1310 for 75-85 GHz

$$S_{\text{req1}} = 1.0 \text{ mW/cm}^2$$

Calculation:

$$S = 9 \times 10^{-6} / 4 \pi R^2$$
$$S = 9 \times 10^{-6} / (12.56 \times 20^2)$$
$$S = 9 \times 10^{-6} / (5024)$$

$$S_1 = 1.79 \times 10^{-9} \text{ mW/cm}^2 (< 1.0 \text{ mW/cm}^2)$$

For 2402-2480 MHz:

Values:

EIRP = 3.0 dBm
 = 2.0 mW
R = 20cm

Power Density Requirement

From table 1 (b) - Limits for General
Population/ Uncontrolled Exposure of
FCC Rule Part 1.1310 for 2402-2480 MHz

$$S_{\text{req2}} = 1.0 \text{ mW/cm}^2$$

Calculation:

$$S = 2.0/4 \pi R^2$$

$$S = 2.0/(12.56 \times 20^2)$$

$$S = 2.0/(5024)$$

$$S_2 = 0.0004 \text{ mW/ cm}^2 (<1.0 \text{ mW/cm}^2)$$

KDB447498 D01 v06 Section 7.2 SIMULTANEOUS TRANSMISSION CONSIDERATIONS

The equipment operates from a single antenna. All transmitters can transmit simultaneously.
As per KDB, summation of calculated MPE ratios for 75-85 GHz and 2402-2480 MHz:

$$\begin{aligned}\Sigma \text{MPE}_{\text{ratios}} &= (S_1/ S_{\text{req1}}) + (S_2/ S_{\text{req2}}) \\ &= (1.79 \times 10^{-9}/1.0) + (0.0004/1.0) \\ &= 0.0004\end{aligned}$$

Σ of MPE ratios < 1.0, so in accordance with KDB447498 Section 7.2, simultaneous transmission test exclusion applies for the transmitters.

Conclusion

The required 20cm RF exposure limits for General Population/Uncontrolled Exposure will not be exceeded for the VEGAPULS 42.