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RF Exposure Considerations for the Danfoss

PR-OCTO

FCC ID: 2ATXJ-OCTO2020

The transmitter operation for the PR-OCTO utilizes 2.4GHz LE Bluetooth and WLAN.

The PR-OCTO also contains certified cellular module FCC ID: XMR2019BG95M3, used in accordance with the conditions of that Grant, including RF exposure compliance.

There is no simultaneous transmission between any of the LE Bluetooth, WLAN or cellular PR-OCTO transmitters.

MPE CALCULATIONS

For mobile product operation 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

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

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

Where S = Power density

EIRP = Effective Isotropic Radiated Power (EIRP = P x G)

P = Conducted Transmitter Power

G = Antenna Gain (relative to an isotropic radiator)

R = distance to the centre of radiation of the antenna (safe operating distance)

Power Density Requirement

From table 1 (b) - Limits for General Population/ Uncontrolled Exposure of

FCC §1.1310 (e) **for f >1500MHz , S_{req} = 1.0 mW/cm^2**

(f = operating frequency)

LE Bluetooth

Transmitter frequency range = 2402 - 2480MHz

G = +4.9dBi

P = +1.0dBm max. (from Tune Up)

EIRP = 5.9dBm (3.9mW)

R = 20cm

$$\mathbf{S_{req} = 1.0\ mW/cm^2}$$

Calculation:

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

$S = 3.9/(12.56 \times 20^2)$

$S = 3.9/(5024)$

$$\mathbf{S_{BT} = 0.001\ mW/cm^2}\ (\text{ie: } <1.0\ mW/\ cm^2)$$

(Equivalent to 0.6 cm safe operating distance at the RF exposure limit of 1.0mW/cm^2)

WLAN

Transmitter frequency range = 2412 - 2462Hz

G = +4.9dBi

P = +7.9dBm max. (from Tune Up)

EIRP = 12.8dBm (19.05mW)

R = 20cm

Calculation:

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

$S = 19.05/(12.56 \times 20^2)$

$S = 19.05/(5024)$

$$\mathbf{S_{WLAN} = 0.0038\ mW/cm^2}\ (\text{ie: } <1.0\ mW/\ cm^2)$$

(Equivalent to 1.23 cm safe operating distance at the RF exposure limit of 1.0mW/cm^2)

Conclusion

The required 20cm RF exposure limits for General Population/ Uncontrolled Exposure will not be exceeded using antennas having a maximum gain of 4.9dBi for LE Bluetooth and WiFi operation.