

RF Exposure / MPE Calculation

No. : 12745193H-A
Applicant : DENSO CORPORATION
Type of Equipment : Telematics Control Unit
Model No. : OGAY17
FCC ID : HYQOGAY17

DENSO CORPORATION declares that Model: OGAY17 complies with FCC radiation exposure requirement specified in the FCC Rule 2.1091 (for mobile).

RF Exposure Calculations:

The following information provides the minimum separation distance for the highest gain antenna provided with the “OGAY17” as calculated from (B) Limits for General Population / Uncontrolled Exposure of TABLE 1- LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE) of §1.1310 Radiofrequency radiation exposure limits.

[WLAN (2.4 GHz) part]

This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 1mW/cm² uncontrolled exposure limit. The Friis formula used was:

$$S = \frac{P \times G}{4 \times \pi \times r^2}$$

Where

$P =$ 27.42 mW (Maximum average output power)

☐ Time average was used for the above value in consideration of 6-minutes time-averaging

☒ Burst power average was used for the above value in consideration of worst condition.

$G =$ 1.563 Numerical Antenna gain; equal to 1.94dBi

$r =$ 20 cm (Separation distance)

Power Density Result $S = 0.00853 \text{ mW/cm}^2$

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OGAY17 contains certified cellular module (FCC ID: JOYDA39)).

The WLAN(2.4 GHz) module and the cellular module both transmit simultaneously in their respective bands. Compliance for simultaneous transmission are shown by the following calculations.

Reference:

[WCDMA Band 2 / LTE Band 2]

This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 1mW/cm² uncontrolled exposure limit. The Friis formula used was:

$$S = \frac{P \times G}{4 \times \pi \times r^2}$$

Where

$P \times G =$ 758.58 mW (Maximum EIRP)

☒ Time average was used for the above value in consideration of 6-minutes time-averaging

☐ Burst power average was used for the above value in consideration of worst condition.

$r =$ 20 cm (Separation distance)

Power Density Result $S = 0.15091 \text{ mW/cm}^2$

[LTE Band 4]

This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 1mW/cm² uncontrolled exposure limit. The Friis formula used was:

$$S = \frac{P \times G}{4 \times \pi \times r^2}$$

Where

$P \times G =$ 389.05 mW (Maximum EIRP)

☒ Time average was used for the above value in consideration of 6-minutes time-averaging

☐ Burst power average was used for the above value in consideration of worst condition.

$r =$ 20 cm (Separation distance)

Power Density Result $S = 0.07740 \text{ mW/cm}^2$

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[WCDMA Band 5 / LTE Band 5]

This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 1mW/cm² uncontrolled exposure limit. The Friis formula used was:

$$S = \frac{P \times G}{4 \times \pi \times r^2}$$

Where

$P \times G =$ 393.55 mW (Maximum EIRP)

☒ Time average was used for the above value in consideration of 6-minutes time-averaging

☐ Burst power average was used for the above value in consideration of worst condition.

$r =$ 20 cm (Separation distance)

Power Density Result $S = 0.07829 \text{ mW/cm}^2$

[LTE Band 12]

This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 1mW/cm² uncontrolled exposure limit. The Friis formula used was:

$$S = \frac{P \times G}{4 \times \pi \times r^2}$$

Where

$P \times G =$ 295.12 mW (Maximum EIRP)

☒ Time average was used for the above value in consideration of 6-minutes time-averaging

☐ Burst power average was used for the above value in consideration of worst condition.

$r =$ 20 cm (Separation distance)

Power Density Result $S = 0.05871 \text{ mW/cm}^2$

Therefore, if WLAN 2.4GHz and WCDMA Band 2 / LTE Band 2 transmit simultaneously,
 $S=0.00853 \text{ mW/cm}^2 + 0.15091 \text{ mW/cm}^2$
 $=0.15944 \text{ mW/cm}^2$

Therefore, if WLAN 2.4GHz and LTE Band 4 transmit simultaneously,
 $S=0.00853 \text{ mW/cm}^2 + 0.07740 \text{ mW/cm}^2$
 $=0.08593 \text{ mW/cm}^2$

Therefore, if WLAN 2.4GHz and WCDMA Band 5 / LTE Band 5 transmit simultaneously,
 $0.00853/1+0.07829/(824/1500) =0.15105<1$

Therefore, if WLAN 2.4GHz and LTE Band 12 transmit simultaneously,
 $0.00853/1+0.05871/(699/1500) =0.13452<1$

Even taking into account the tolerance, this device can be satisfied with the limits.

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