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/cm^2 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 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/cm^2 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 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/cm^2 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 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/cm^2 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 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/cm^2 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 mW/cm^2**

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

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