RF Exposure / MPE Calculation

No.	:	12804674H-A-R1
Applicant	:	DENSO Corporation
Type of Equipment	:	Control Box
Model No.	:	DNNS097 *WLAN (2.4 GHz band) and Bluetooth Low Energy part
FCC ID	:	HYQDNNS097

DENSO Corporation declares that Model: DNNS097 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 "DNNS097" 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 band) 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 = 37.24 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 = 0.513 Numerical Antenna gain; equal to -2.9dBi

r = 20 cm (Separation distance)

Power Density Result S = **0.00380 mW/cm^2**

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[Bluetooth part]

Low Energy

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 = 0.81 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 = 0.513 Numerical Antenna gain; equal to -2.9 dBi

r = 20 cm (Separation distance)

Power Density Result S = **0.00008 mW/cm^2**

BDR/EDR (Reference)

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 = 0.79 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 = 0.513 Numerical Antenna gain; equal to -2.9 dBi

r = 20 cm (Separation distance)

Power Density Result S = **0.00008 mW/cm^2**

Therefore, if WLAN (2.4 GHz band) and Bluetooth transmit simultaneously,
S = 0.00380 mW/cm^2 + 0.00008 mW/cm^2
= 0.00388 mW/cm^2

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

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