

Study and Proposal on OCC for Automotive Glass using EV Model (Third Report)

- POC of Digital Authentication Protocol with EV Cabin Thermal Model- Part 2 -

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OCC (Off-Cycle Credit) is an important credit regulation for CO₂. In the first report, we reported the results of a basic study on OCC for automotive glass using the EV cabin thermal model (Fig.1). In the second report, we report on a simulation of annual CO₂ emissions of EV as POC (Proof Of Concept) for digital authentication protocol using the EV cabin thermal model. In the third report, we compare the calculation method of the US OCC with the EV cabin thermal model.

The EV model was developed using the international standard language VHDL-AMS for EVs, and its calculation accuracy and application examples were reported in previous research reports.

The digital certification currently under consideration consists of two stages: (1) an accuracy verification process by comparing the vehicle model used with experiments, and (2) certification of assumed cases of simulations performed using the vehicle model.

In the previous report, we calculated the annual driving range and CO₂ emissions for two cities: Sapporo and Kagoshima. In this report, we calculated the solar heat gain coefficient (T_{ts}) and the re-radiated heat (q_i) from glass to the interior, which are used in OCC evaluation, using the EV model.

Fig. 2 shows the T_{ts} and q_i results for Sapporo in winter.

The q_i value is particularly negative for heat-reflective glass, indicating that heating heat from the interior is released outside the vehicle during winter heating.

Therefore, in cold regions during winter, heat-reflective glass reduces driving range and increases CO₂ emissions. T_{ts} and q_i, which have been used for summer evaluation, yield the opposite results in winter evaluation. A new evaluation method is needed to replace T_{ts} and q_i for winter evaluation, which is a weakness of EVs.

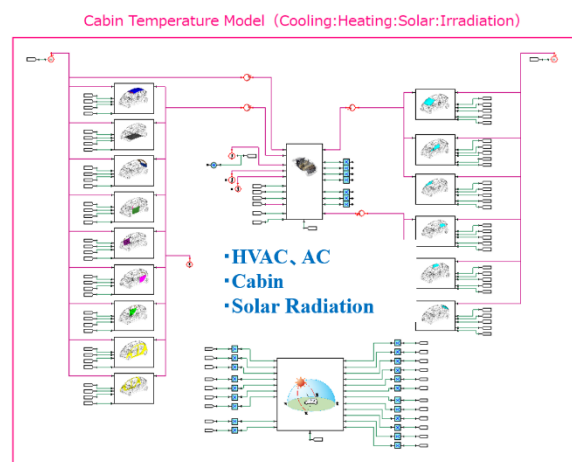


Fig.1 Cabin thermal model.

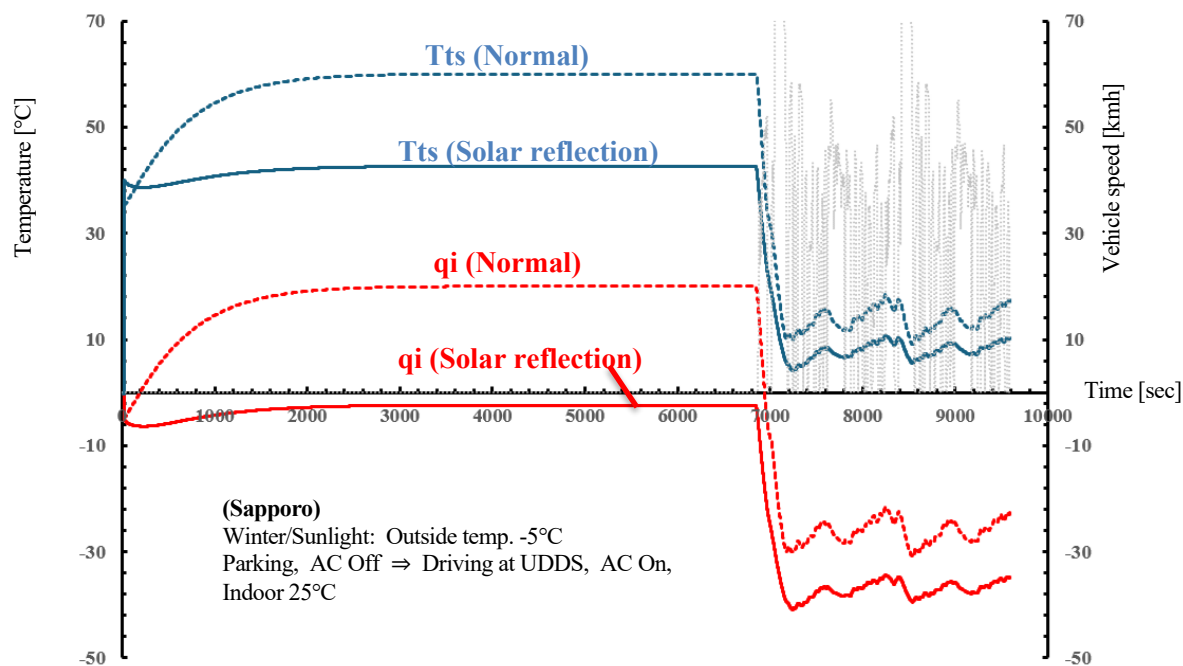


Fig.2 T_{ts} and q_i change when driving in UDSS mode from parking.