

One Class Above Quietness Development Based on New EV Platform

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Main noise sources of ICE passenger vehicle are engine noise, road noise and wind noise. EV does not have engine noise, so it is quieter than ICE vehicle. But road noise when take off and low speed driving scene becomes more noticeable on EV because of no masking effect by engine noise. EV also has motor noise that is not on ICE. So specific NV planning are needed for EV. This paper describes quietness technologies on new EV.

Newly designed EV specific platform, new higher output powertrain and bigger capacity battery than existing EV are applied to new EV. Electrically Excited Synchronous Motor(EESM) was also applied for efficiency and quietness.

Key points of new platform are 1) Heating Ventilation and Air Conditioning(HVAC) was located in motor room for roominess, 2) Bigger but thinner battery realized long mileage and roominess by flatfloor.

Concepts of new EV quietness are absolute isolation feeling when get into the vehicle and door closed, very quiet and smooth acceleration when take off.

Key factors are, rigid body and isolated suspension member for road noise, isolation improvement for floor and dash panel penetration area with HVAC, motor excitation force improvement and Motor Mounting vibration transmission improvement.

To realize rigid body, battery frame stiffness was improved and it was used for the part of body structure(Fig.1).

HVAC cover become part of dash panel because of HVAC location is in motor room(Fig.2). So it has double isolation wall structure same as other dash panel area. HVAC isolation structure is consists of several parts because of productivity, so zero leakage was designed by tolerance control and overlap design.

Floor isolation was improved by noise absorption material application for under floor cover and floor structure with battery used as shield.

Motor Electric excitation force is improved especially at low torque area because EESM current can be optimized both for Rotor and Stator.

Motor Mounting Bracket length was minimized with new suspension member structure(Fig.3). It made Bracket resonance separate from powertrain resonance, so vibration transmission from powertrain to body is minimized.

As the results of these technology application, new EV achieves upper class quietness especially in following scene. At take off scene, new EV has 15dB better quietness than C-SUV segment ICE(Fig.4). New EV also has 10% better isolation feel than ICE, unrecognizable level of motor noise.

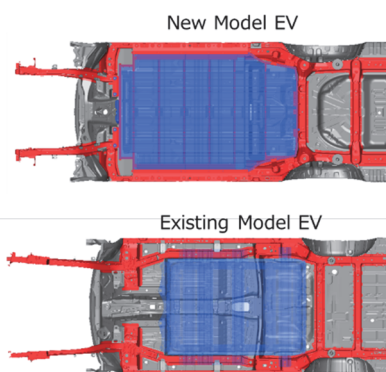


Fig.1 Body Structure Different Existing and New Model.

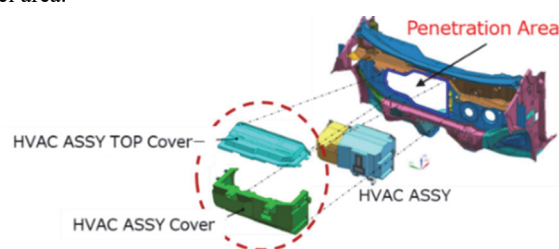


Fig.2 Structure for HVAC Isolation Parts.

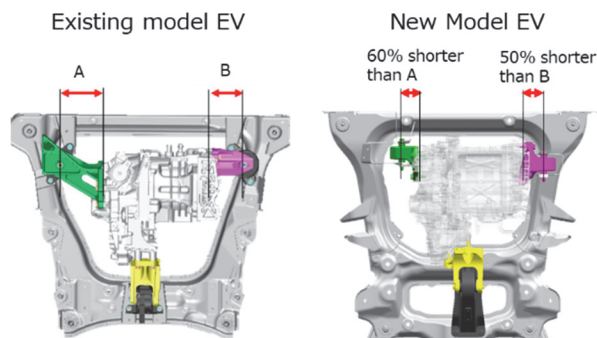


Fig.3 Motor Mounting Bracket Improvement Structure

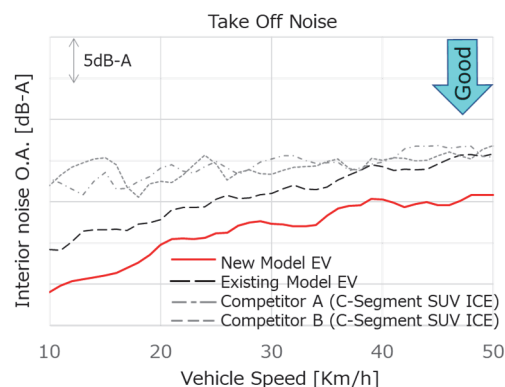


Fig.4 Noise Level Improvement at Take Off Compare ICE C-segment Vehicle