

Numerical Investigation on the Interior Wind Noise of a Passenger Car

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Abstract : With the development of the automotive technology and electric vehicle, the contribution of the wind noise on the interior noise becomes the main source of noise. The main transfer path which the exterior excitation is transmitted through is the greenhouse panels and side windows. Simulating the wind noise transmitted into the vehicle accurately in the early development stage can be very challenging. The basic methodologies of this study were based on the Lighthill analogy; the exterior flow field around a passenger car was computed using unsteady Computational Fluid Dynamics (CFD) firstly and then a Finite Element Method (FEM) was used to compute the interior acoustic response. The major findings of this study include: 1) The Sound Pressure Level (SPL) response at driver's ear locations is mainly induced by the turbulence pressure fluctuation; 2) Peaks were found over the full frequency range. It is found that the methodology used in this study could predict the interior wind noise induced by the exterior aerodynamic excitation in industry.

Keywords : wind noise, computational fluid dynamics, finite element method, passenger car

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