AERO-VIBRO-ACOUSTICS FOR WIND NOISE APPLICATION

Marco Oswald, Chris Wolfe*

Technical Account Manager, Lead Product Manager, ANSYS

***presenting author and author to contact**

Chris Wolfe
10 Cavendish Court
Centerra Resource Park
Lebanon, NH 03766
Office: 603.727.5550
e-mail: chris.wolfe@ansys.com

KEYWORDS

Wind noise, aerodynamic noise, acoustics simulation

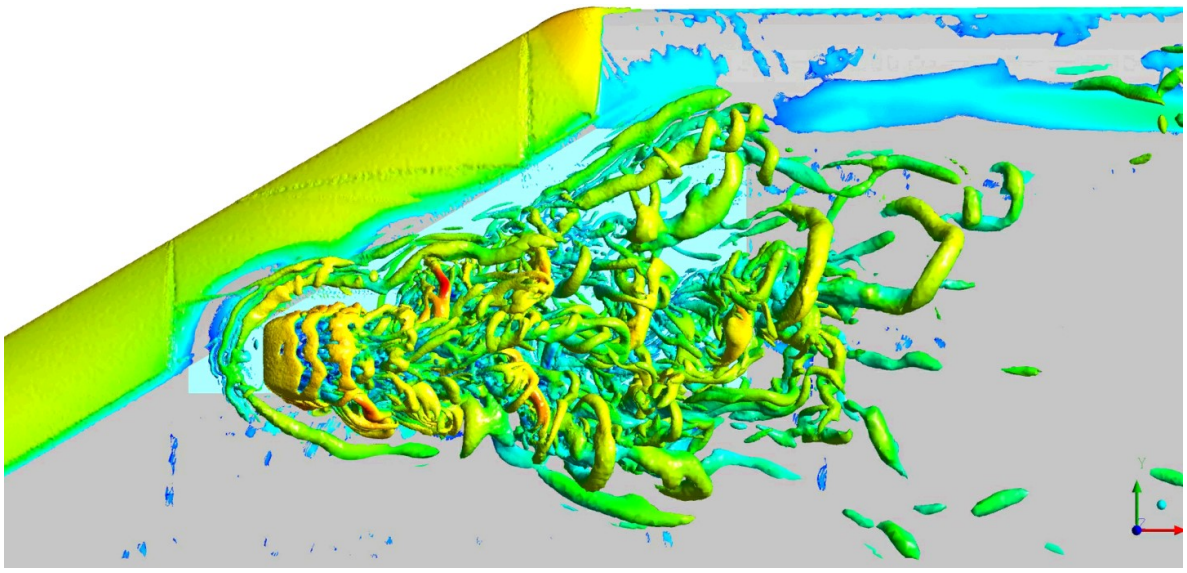
ABSTRACT

Optimizing aerodynamics for minimizing drag force is an easier challenge than reducing the wind noise. Assessment of this aerodynamic noise is an important quality concern for automotive manufacturers. The J.D. Power 2014 U.S. Vehicle Dependability Study report lists excessive wind noise amongst the top five problems most commonly experienced by vehicle owners. The wind noise becomes the dominant noise source for higher driving velocities. Air flowing past a vehicle may lead to high interior noise levels and affect cabin comfort. The interior noise results from various mechanisms:

1. Aerodynamic fluctuations of the disturbed flow around the side mirror and A-pillar
2. Hydrodynamic and acoustic loading of the car panels and windows
3. Panel vibration and acoustic radiation inside the vehicle

This presentation captures these important mechanisms in one simulation environment and demonstrates the ability of coupled CFD and FEM tools to provide accurate aerodynamic and interior noise prediction results demonstrated at the SAE-Body with side-view-mirror. The exchange format to share the Fast-Fourier-transformed time signal of the aerodynamic-part with the Harmonic Response simulation in the

frequency-domain is the open and widely known CGNS format. This allows flexible workflow adaption. The results are validated against measured data, which includes pressure spectrum at several probe positions on the window, laser-scanning vibrometer measurements for window displacements and sound pressure data at the driver's ear. The simulation method is called Deterministic Aero-Vibro-Acoustics (DAVA), because it is fully based on first principles not requiring statistical or empirical techniques such as Statistical Energy Analysis (SEA) or transfer functions.



Q-criteria near the side-view-mirror colored by velocity magnitude