Three dimensional visualization of vehicle exterior and interior noise based upon a scanning measurement technique utilizing particle velocity sensors.

Marcin Korbasiewicz[1], Jasper Serraris[1], Daniel Fernandez Comesana[1], Steven Steltenpool[1]

[1]Microflown Technologies, Tivolilaan 205, 6824 BV, Arnhem, the Netherlands

e-mail: korbasiewicz@microflown.com

The introduction of alternative powertrains to the world of automotive along with increasing severity of noise regulations and customer requirements, has propelled NVH engineers to pursue precise measurement tools which would allow for a comprehensive analysis of noise emitted by various car components in their operating environments and in the full three dimensional space. Traditional, sound pressure based, measurement techniques offer a variety of possibilities of sound visualization. However, their performance is a result of a compromise between frequency limitations and spatial resolution of the obtained visualization. In this paper an application of a novel three-dimensional sound visualization technique, Scan & Paint 3D, is discussed. This technique is based on a Microflown *USP probe (3D Sound Intensity probe)* which consists of one pressure microphone and three orthogonally positioned particle velocity sensors, allowing for 3D visualization of time stationary sound fields in the frequency range from 20 Hz – 10 kHz. In the presented application two measurement scenarios are evaluated. In the first scenario the noise transmission from the car cabin interior to the exterior is assessed, with the aim of highlighting the dominant areas along with their radiation pattern. In the second scenario, the car cabin interior noise distribution is quantified and visualized using the same measurement technique, with an ultimate aim of identifying the dominant noise sources inside of the car cabin interior.