

Application of PIV in Acoustic and Aeroacoustic Experiments

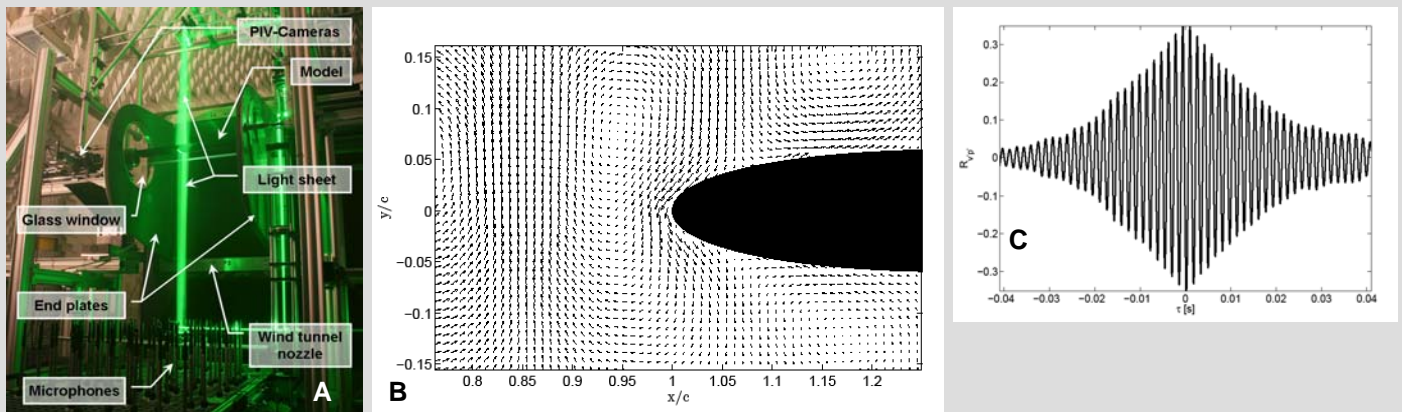
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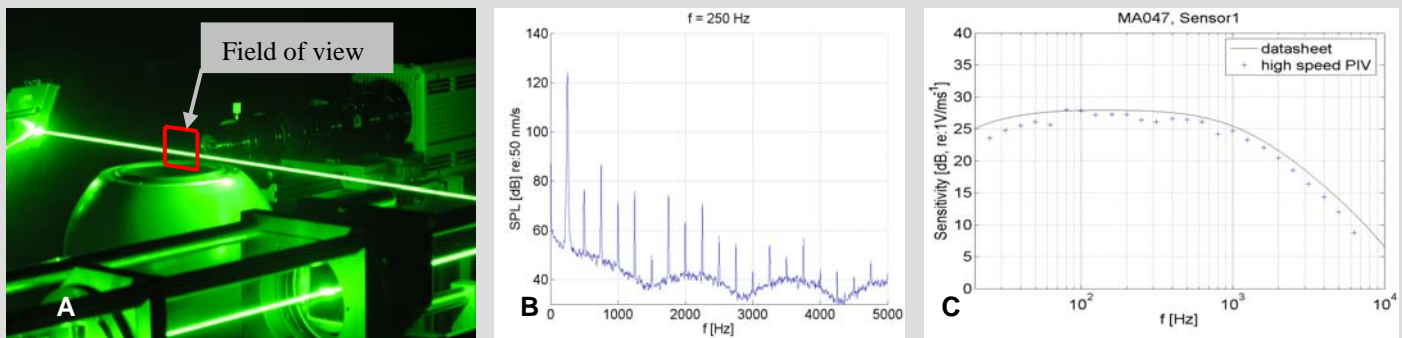
Abstract: Different applications of the PIV technique in the field of acoustics and aeroacoustics are presented. This includes the investigation of cavity resonance and the calibration of a p-u probe, which is used for acoustic intensity measurements. Additionally, we present applications of the causality correlation technique by means of simultaneous PIV and microphone measurements. The method is used for the identification of flow structures that are involved in the generation mechanism of aeroacoustic noise sources.

Causality Correlation by means of simultaneous PIV and Microphone-Array measurements



Velocity-components u and v are measured with PIV. Pressure fluctuations p' are obtained by means of an microphone-array measurement in the far-field. **A:** Experimental setup of a rod-airfoil configuration. **B:** Instantaneous distribution of the cross correlation coefficients ($R_{u';p'}$, $R_{v';p'}$) for $\tau = 0$ ms as a vector plot near the airfoil leading edge. **C:** The temporal evolution of the cross correlation coefficients $R_{v';p'}(\tau)$ near the leading edge of the airfoil.

Calibration of a particle velocity sensor using High-Speed-PIV



A: Detailed view of the laser light-sheet illuminating the near field region of the HF loudspeaker. In the background the long-distance microscope and the high-speed camera are visible. **B:** Spectral representation of the measured time signal. Depicted is SPL [dB] re: 50 nm/s measured with the high-speed PIV system in the near-field of the HF loudspeaker at 250 Hz. **C:** Sensitivity [dB re:1V/ms⁻¹] of the p-u probe measured with the high-speed PIV system. The black line shows the calibration curve given by the manufacturer.

High-Speed-PIV investigation of cavity resonance

The buffeting effect is investigated on a generic large scale cavity. **A:** Instantaneous velocity distribution. **B:** Re-Number dependent frequency distribution.

