

Fourier transformation analysis of interferometric flow image

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The presentation focuses on the FTFA (Fourier Transform Fringe Analysis) method of quantitative analysis of interferometric images. Interferometry is a visualization technique especially suitable for investigation of flows with significant compressible effects (for example flows with shock waves). In ‘traditional’ approach, this technique is demanding, as it requires extremely high quality of optical elements, precise adjustment of the system and still the results of analysis are more qualitative than quantitative.

The presented method of analysis is based on Fourier transformation. Compared against the abovementioned traditional approach, it has significant benefits. The results obtained are quantitative (a continuous map of gas parameters over the whole region visible in the interferogram). There is no need of introducing of mechanical elements (like probes) into the zone of interest in the flow domain. This method allows one to use less demanding ‘finite fringe’ adjustment of the interferometer thus reducing the adjustment time. It also reduces the influence of errors originating from inevitable optical imperfections of the interferometer.

An exemplary result of analysis for a supersonic flow with λ -foot shock wave interferogram will be presented.

Uncertainty analysis and some remarks on numerical implementation will also be given in the presentation.