Combined 2D shifted Profile Sensor: Measurements

Overview

In order to characterize **turbulent boundary layers** and **strong velocity gradients** ILA R&D and its partners recently developed a new measurement technique: The Profile Sensor. The Combined 2D shifted Profile Sensor is an enhancement that allows measuring velocity components in two dimensions. One of which can be obtained with the **high spatial resolution** of a profile sensor. By shifting the frequency of one laser beam respectively for each wavelengths not only the velocity values can be detected but also their direction. This is an important feature especially in turbulent flows and recirculation areas.

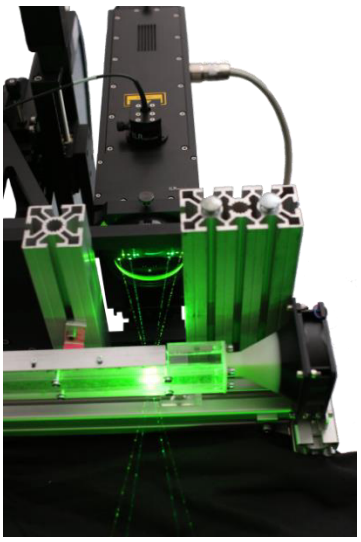
The idea of a profile sensor is to overlap two measuring volumes with different wavelengths. One has a convergent fringe distance and the other has a divergent fringe distance. That way the particle position z inside the measuring volume can be calculated by using the ratio of the detected Doppler frequencies. This results in a spatial resolution which is about 100 times higher than conventional LDV measurements (1% of Measuring Volume). This allows determining the (time-averaged) velocity profile within the boundary layer. The non-invasive nature of this measurement technique allows analyzing very small structures that are susceptible to disturbances. Due to the analysis of the **velocity fluctuations** the relationships between **eddy viscosity**, **flow profile** and **shear stress** can be investigated.

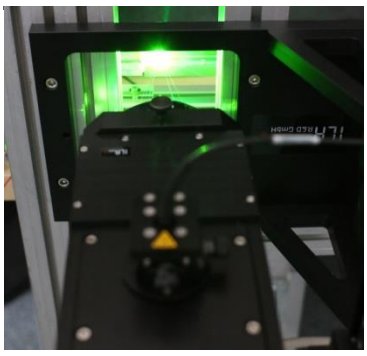
The figures on the side show a measurement setup for the investigation of the turbulent boundary layer in a porous structure. The measuring section is located in a small rectangular wind tunnel. The porous structure is placed on the back wall of the wind tunnel. The point diagram above shows the obtained individual measurement values. Averaged over time the result delivers a detailed and reliable picture of the turbulent flows in the investigated boundary layer.

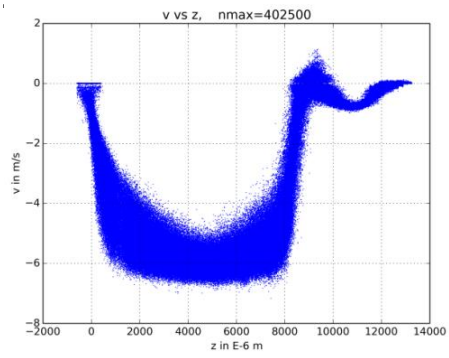
The Combined 2D LDV Profile Sensor Measurement provides an insight into the formation of turbulent structures and boundary layers while measuring the velocity component in a second dimension simultaneously. It is therefore a suitable tool for the **validation** of turbulence modelling and CFD. This technique should not be missing in any institute or company dealing with research about flow phenomena.

Main Features

- 2D measurement with high spatial resolution
- High accuracy
- High long term stability
- Contactless







ILA R&D GmbH
Rudolf-Schulten-Str. 3
52428 Jülich
Germany

✉ info@ila-rnd.de
☎ +49 2461 328996-0
www.ila-rnd.de