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# Planar Imaging of Flame / Wall Interaction

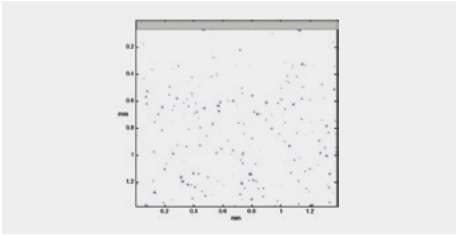

Image of near wall μ-PIV measurement

Long distance microscope

## Motivation

This project focuses on the enhancement of planar imaging techniques (e.g. PLIF and PIV) for reactive flows close to walls. In former work, these experimental methods have been used for unconfined reactive setups, whereas the near wall region has not been investigated in detail yet. New insights are expected in applications like internal combustion engines where flame-wall interaction plays a significant role.

## Method and Theory

Planar laser-induced flourescence (PLIF) has been used successfully in the investigation of reactive flows in the past. For concentration measurements in gaseous flows tracers have been applied to provide a way to study fluid mixing in flowing systems. In this context, acetone is a key tracer molecule, whose luminescence characteristics have been well studied. A broad absorption spectrum eases the excitation with solid-state lasers.
Particle Image Velocimetry (PIV) uses statistically correlating images of tracer particles in the flow to gather information from an instantaneous fluid flow field. The $\mu$-PIV technique has to overcome a very small field of view because of the high magnification factor which implicates new problems like the need for a larger tracer-particle concentration. The usage of optical design software allows to model the imaging system in order to find possibilities for the optimization regarding spatially highly resolved measurements close to the wall. One option could be the employment of optics that provide a higher magnification. The investigation of the reactive flows restrict the minimum working distance due to the setup and the heat release. Long distance microscopes offer a way to achieve both conditions.

## Proceeding

The first step will be PLIF imaging of the evaporation of an aceton drop positioned on a heatable wall. Several boundary conditions like surface temperature and structure have to be considered. A number of basic questions like the range of the influence of the wall has to be answered. A continuation of the investigations could be done with the observation of impinging drops in an isotherm and a reacting case. Additionally, information from the flow field can be captured with $\mu$-PIV measurements.