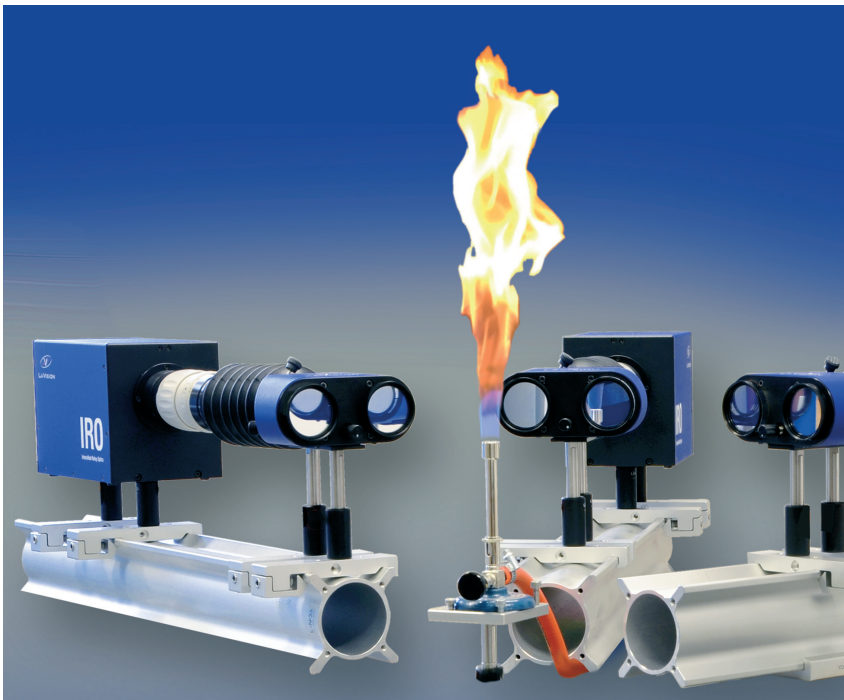


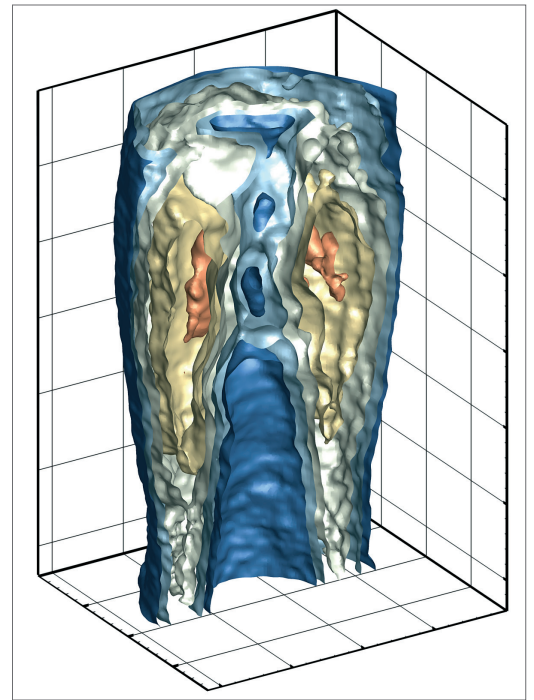
IN APPLICATION

Tomographic LIF Imaging in Turbulent Flames

FlameMaster 3D-LIF Imaging Systems



Multi-view camera setup for 3D-LIF imaging



3D OH-distribution in a turbulent flame

Introduction

Turbulent combustion processes are three-dimensional (3D) in nature and, therefore, only instantaneous 3D flame imaging techniques can reveal the complex 3D distribution of flame species.

LaVision's **FlameMaster 3D-LIF** laser imaging systems support single shot tomographic **Laser Induced Fluorescence (LIF)** imaging of combustion species such as OH and unburnt fuel. While standard (2D) LIF imaging applies laser sheet illumination, 3D tomographic LIF imaging uses volume illumination and multiple views for the simultaneous detection of the LIF signal. The short laser pulse freezes the turbulent flame motion in time. High-speed cameras and lasers enable time-resolved 3D-LIF imaging.

System Features

- ▶ instantaneous 3D-LIF imaging of flame species and unburnt fuel
- ▶ flexible and upgradeable multi-camera setups with image doublers
- ▶ automatic 3D camera calibration up to 16 views
- ▶ highly accurate and robust tomographic reconstruction algorithms
- ▶ high-speed LIF imaging systems for time-resolved 3D flame imaging

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Tomographic LIF Imaging in Turbulent Flames

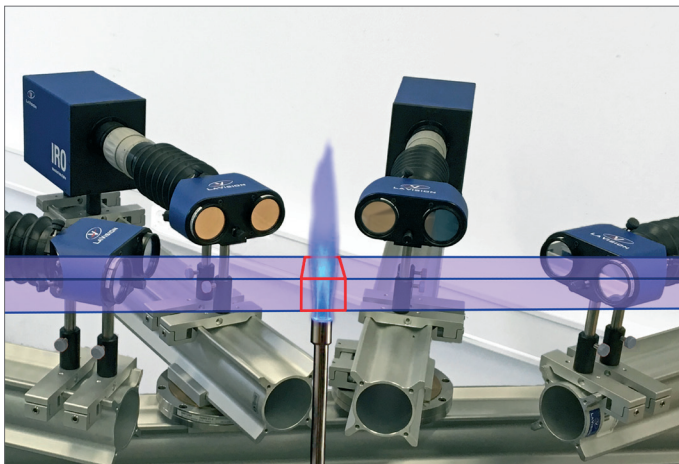
FlameMaster 3D-LIF Imaging Systems

FlameMaster 3D-LIF system for instantaneous, volumetric OH-imaging

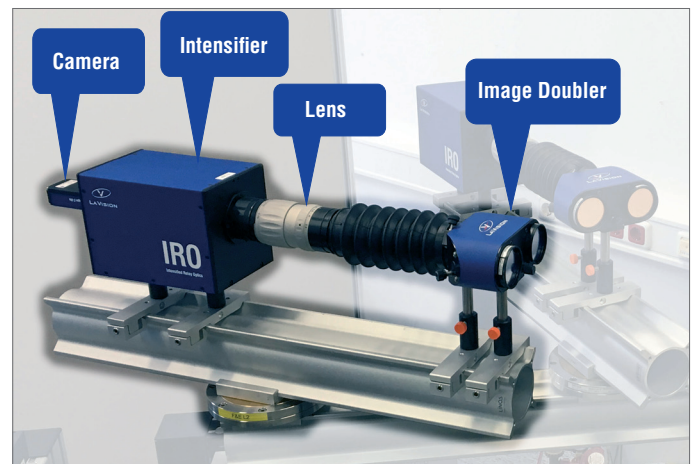
A narrowband tunable dye-laser delivers 20 mJ at 283 nm for OH-LIF detection at a probe volume of $3 \times 3 \times 3 \text{ cm}^3$ in size. The OH-LIF signal generated in a turbulent jet flame is detected with four intensified cameras each equipped with an image doubler. The volume is calibrated in space using eight views recording a single 3D calibration target. The tomographic imaging software

module in DaVis is reconstructing the 3D-OH distribution in the flame using all eight LIF projections. This 3D-LIF imaging setup is able to resolve flame structures smaller than 1 mm.

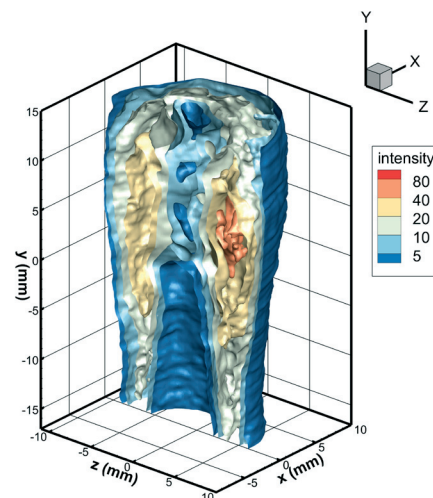
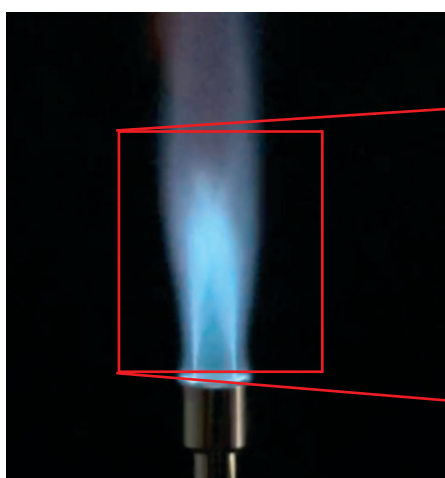
The **FlameMaster 3D-LIF system** can also measure unburnt fuel and its interaction with the flame front in 3D. High-speed time-resolved 3D-LIF imaging is performed with our **FlameMaster High-Speed** laser imaging systems featuring frame rates up to 50 kHz.



4 intensified cameras with image doublers for tomographic imaging based on 8 views



Intensified camera module for 2-channel OH-LIF detection using an image doubler



Laser illuminated probe volume in the turbulent Bunsen flame and instantaneous volumetric OH-concentration field measured with the FlameMaster 3D-LIF imaging system

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