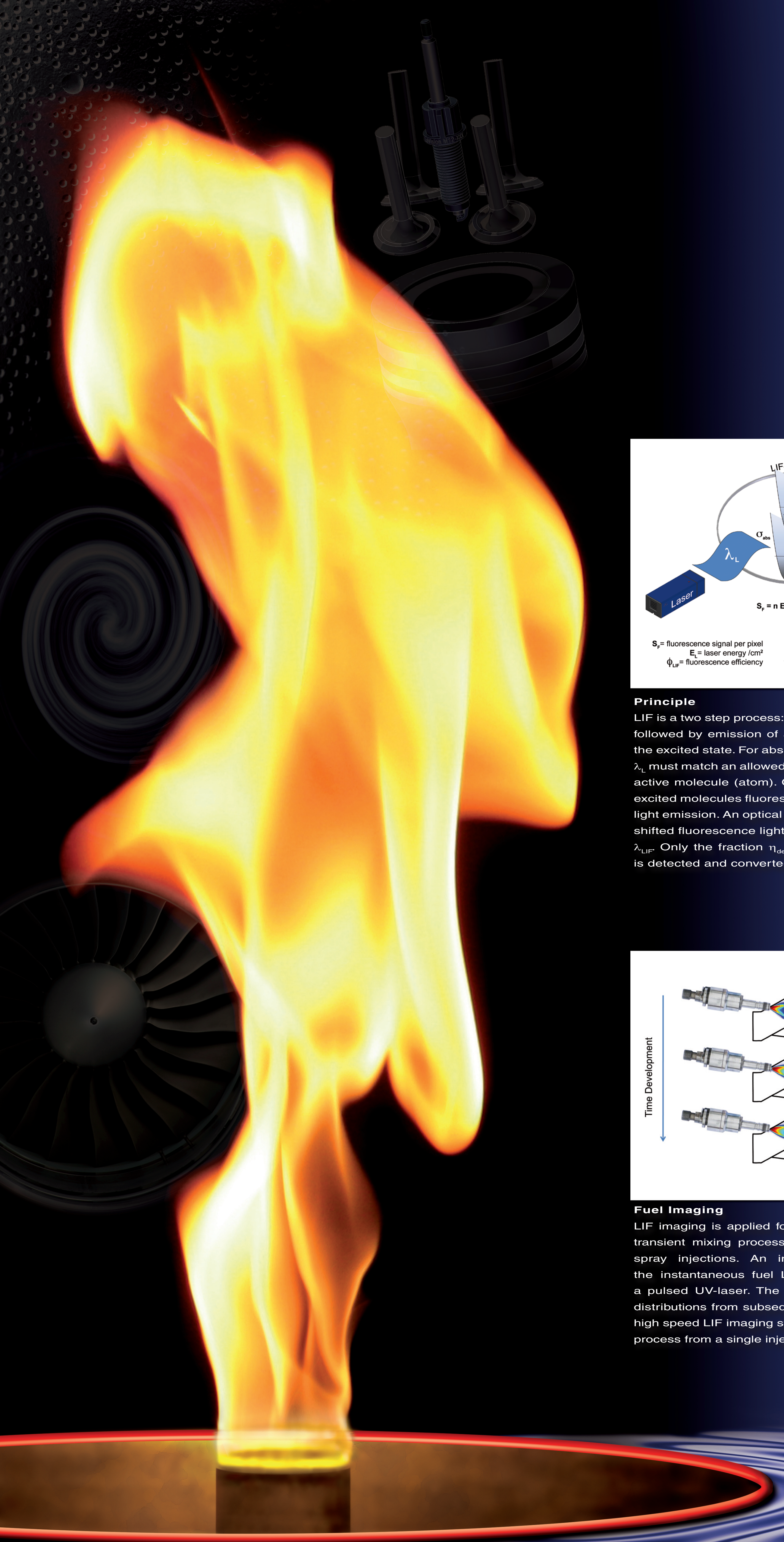
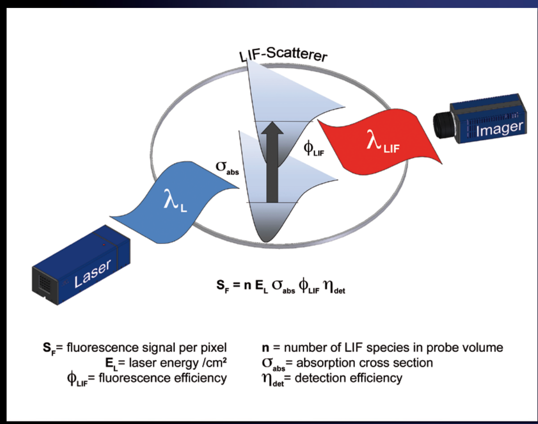
LaVision

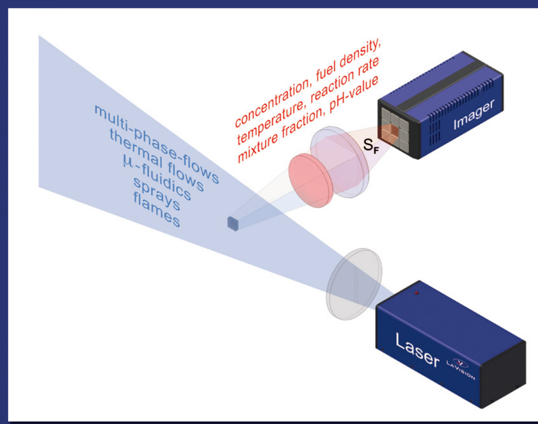
FOCUS ON IMAGING





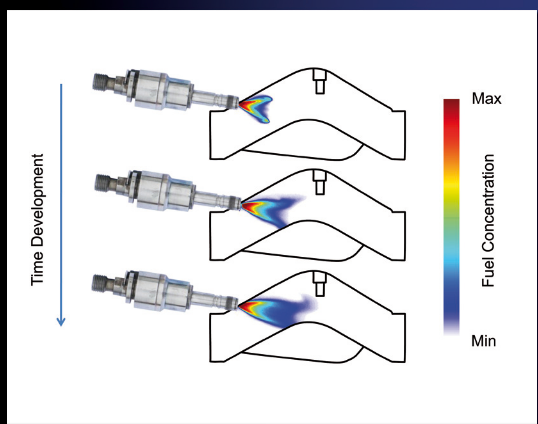
Principle

LIF is a two step process: absorption of a laser photon followed by emission of a fluorescence photon from the excited state. For absorption the laser wavelength λ_L must match an allowed energy transition of the LIF-active molecule (atom). Only a fraction Φ_{LIF} of these excited molecules fluoresces, the rest relaxes without light emission. An optical filter selects the usually red-shifted fluorescence light at the emission wavelength λ_{LIF}. Only the fraction η_{det} of all emitted LIF-photons is detected and converted to the camera signal SF.



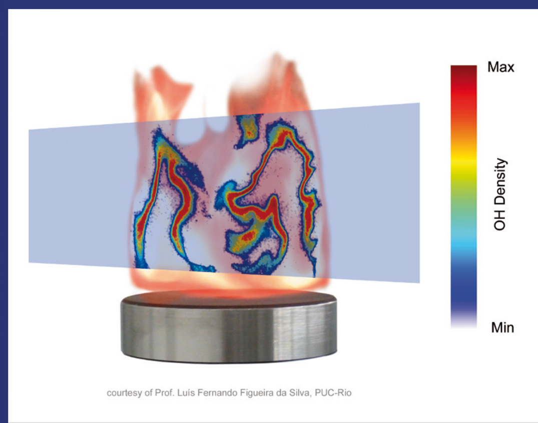
Imaging Setup

A laser beam is formed to a light sheet and intersects the fluid area of interest, e.g. in flames, sprays or thermal flows. The resulting fluorescence light from excited molecules in the light sheet is imaged through a selective filter onto a time-gated digital camera. For pulsed UV LIF applications usually an image intensifier amplifies the LIF signal. The conversion of LIF images into meaningful concentration or temperature fields is based on calibration measurements.



Fuel Imaging

LIF imaging is applied for the investigation of highly transient mixing processes such as in-cylinder fuel spray injections. An intensified camera detects the instantaneous fuel LIF distribution excited with a pulsed UV-laser. The time sequence shows fuel distributions from subsequent fuel spray injections. A high speed LIF imaging system can capture the entire process from a single injection.



Flame Imaging

In combustion research LIF imaging is mostly used for the detection of flame radicals with concentrations in the lower ppm range. The image shows the instantaneous distribution of OH-radicals in a turbulent diffusion flame within the laser light sheet. For smaller molecules such as flame radicals efficient LIF-excitation is achieved with narrow-band tunable lasers. In combination with intensified cameras and emission filters the LIF imaging technique provides the highest detection sensitivity for minority flame species.

LIF Imaging

Planar Laser Induced Fluorescence (PLIF) is a very sensitive laser imaging technique for species concentration, density, and temperature measurements in fluid mechanical processes, sprays, and combustion systems. LIF imaging is a molecule specific visualization method with high spatial and temporal resolution. If the fluid itself contains no LIF-active species, flow seeding with fluorescent markers (tracers) is used for scalar flow field imaging (Tracer-LIF).

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