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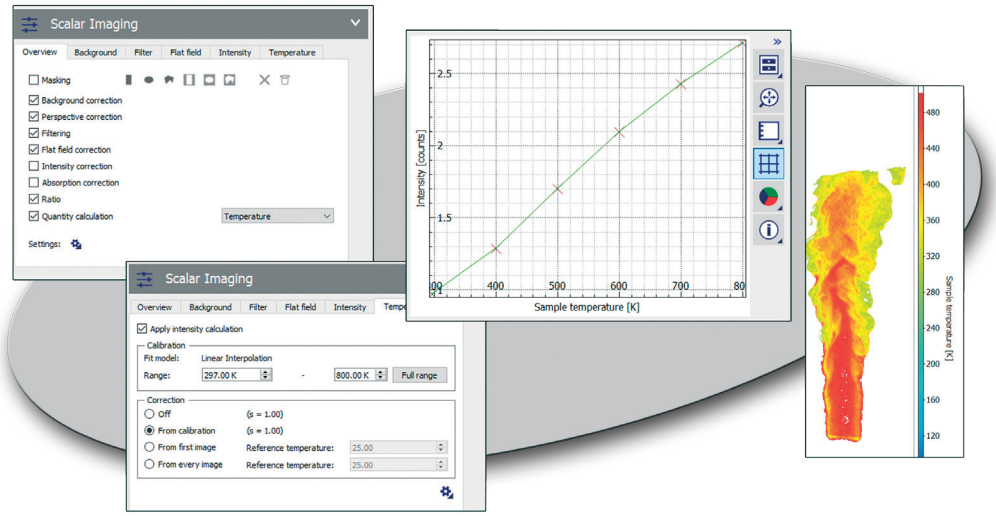
LIF Image Processing Software

Simplified workflow for scalar imaging with uncertainty quantification

Quantitative LIF imaging and scalar laser imaging in general needs a precise conversion of camera counts (photo-electrons) into physical units like concentration or temperature. For LIF signal calibration LIF images under known conditions at pre-selected points are recorded. A calibration curve is fitted to these calibration points using a meaningful physical model including uncertainty ("error") bands.

The LIF image captured by the camera requires different image corrections to obtain the desired "pure" LIF image free of any artifacts like background contribution, laser sheet inhomogeneities, vignetting or possible image distortion effects.



With **DaVis 10.1.1** LaVision releases a new software for scalar laser imaging systems supporting LIF for concentration and temperature imaging as well as LII for soot imaging.

New simplified workflow

The complex workflow for quantitative scalar imaging includes noise-filtering and masking, the handling of several image files such as background, laser sheet and white image, and finally a calibration which converts camera counts to the desired physical unit. The new **LIF Image Processing** module in DaVis simplifies this entire process for the user by introducing a fully integrated and guided workflow including all required processing steps in a single operation, which then automatically processes the image sequence in the right order.

A new feature is the implemented uncertainty analysis for LIF imaging. The uncertainty calculation considers camera and signal photon noise, the uncertainty of all correction images as well as in the signal calibration, and shows the trade-off between measurement precision and spatial resolution. Additionally, it allows to optimize both experimental and processing parameters to minimize measurement uncertainties.

Live processing

The new live processing functionality makes the overall process very interactive, consistent and pleasant to handle.

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Benefits of
LIF image processing

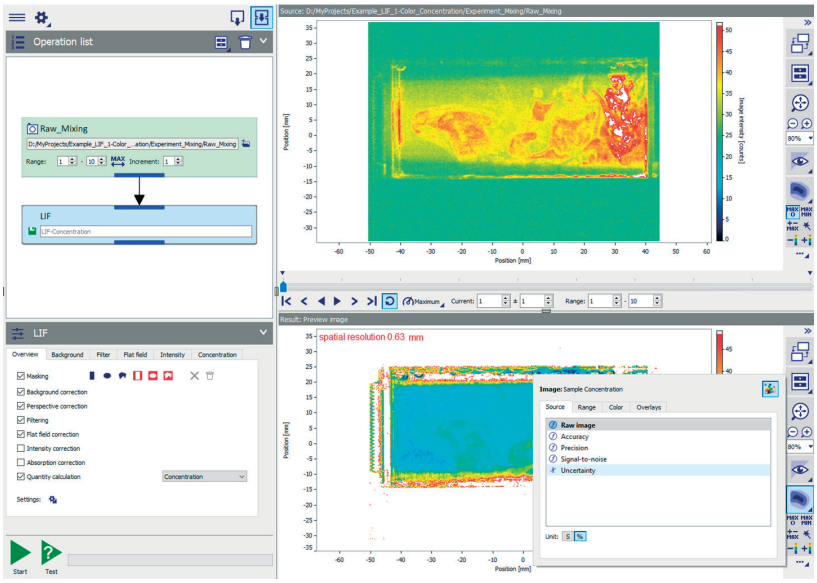
Usability improvements

- live processing with instant result presentation
- fixed processing sequence for correct and easy operation
- automatic preprocessing
- simpler project handling (including PIV processing)

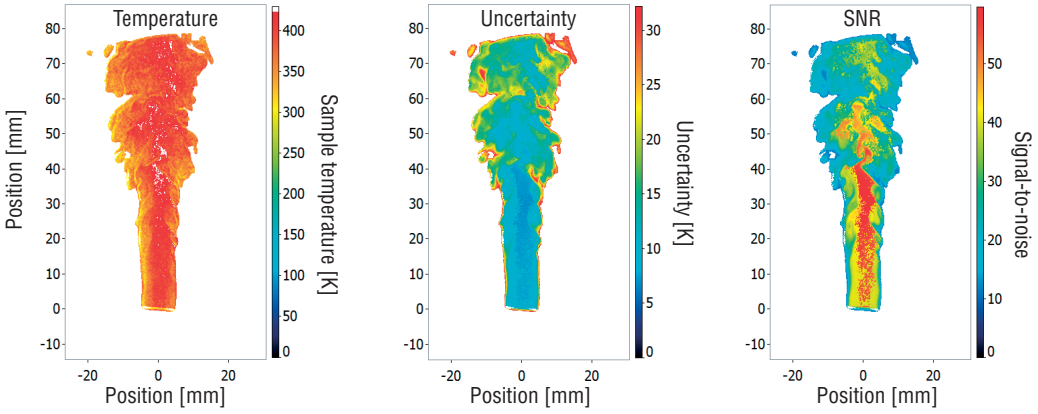
Uncertainty propagation including

- camera read-out and signal photon noise
- uncertainty introduced by background and flatfield images
- calibration errors
- spatial resolution effecting signal intensity

For all users with an additional PIV license, the PIV processing operations are also available inside the scalar imaging projects. This makes data handling easier, as conversion of the project type is not required any more for multi-parameter laser imaging systems which combine scalar imaging and PIV.



LIF temperature field
Uncertainty
Signal-to-noise ratio



LIF temperature field of a heated gas jet together with the derived uncertainty field (measurement precision) and corresponding signal-to-noise ratio (SNR)

Sep-20

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