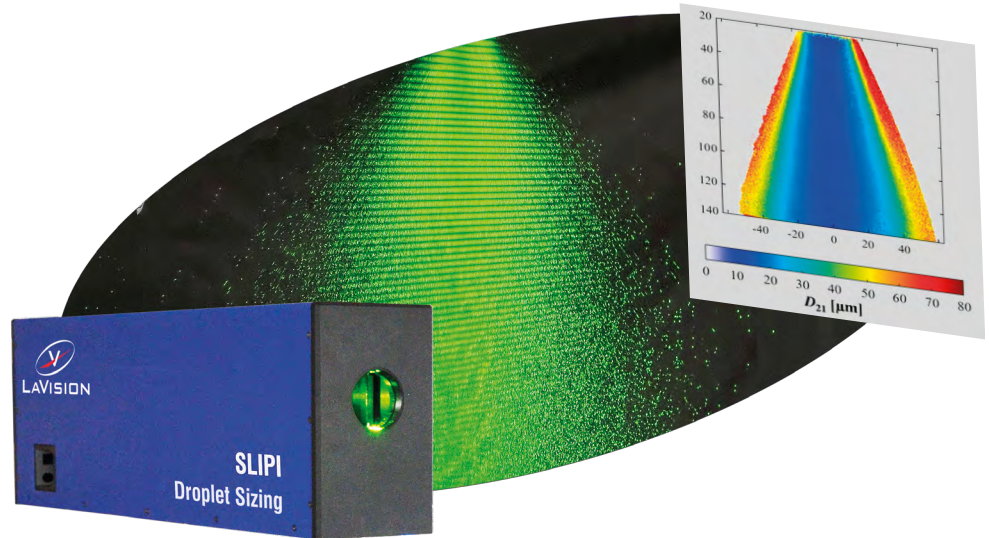


SLIPI Droplet Sizing

Polarization ratio imaging

SLIPI Droplet Sizing is a cutting-edge development combining SLIPI imaging and polarization-ratio techniques for accurate droplet size analysis, without the use of complex UV laser setups or fluorescent tracers.



How it works

SLIPI Droplet Sizing combines **SLIPI** with **polarization ratio imaging** for tracer-free droplet sizing in optically dense sprays. In contrast to conventional imaging with a uniform laser light sheet, SLIPI uses a spatially modulated laser light sheet to illuminate the measurement plane. Light scattered only once by the droplets retains this modulation, while multiply scattered light largely loses the modulation information. SLIPI processing extracts the modulated signal and suppresses contributions from multiple scattering, providing improved image contrast even in optically dense sprays.

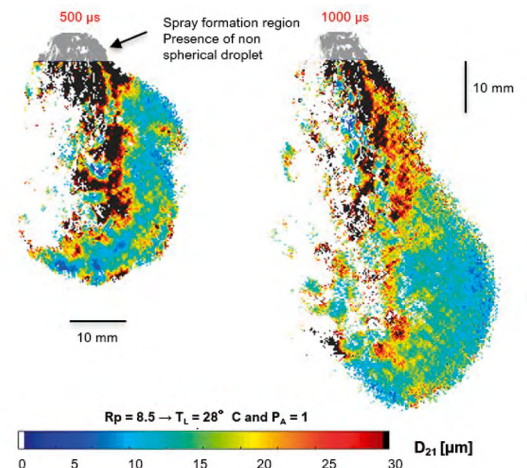
For droplet sizing, the perpendicular and parallel polarized components of the Lorenz–Mie scattered light are recorded. Their polarization ratio is related to the D_{21} **surface mean diameter**, enabling planar droplet size measurements without fluorescent additives. The system operates with continuous wave (cw) laser illumination at 532 nm and provides a compact and flexible setup for integration into existing systems.

Next generation
spray diagnostics

LaVision offers multiple SLIPI configurations to meet different diagnostic needs— from quantitative size analysis to tracer-free, polarization-based measurements.

- ▶ Planar droplet size distribution D_{21} surface mean diameter
- ▶ No need for fluorescent additives
- ▶ Operates with visible (green) CW laser
- ▶ Ideal for evaporative or any complex spray
- ▶ Flexible and easy setup

Droplet size distributions D_{21} of ammonia sprays at different injection time.



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SLIPI droplet sizing in ammonia injection

The powerful capabilities of **SLIPI Droplet Sizing** are reflected in the recent award-winning study on ammonia injection– named best paper in Experimental Spray Diagnostics at ILASS Europe 2025.

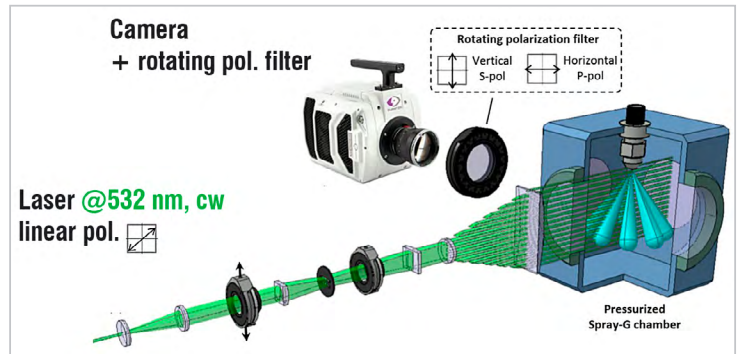
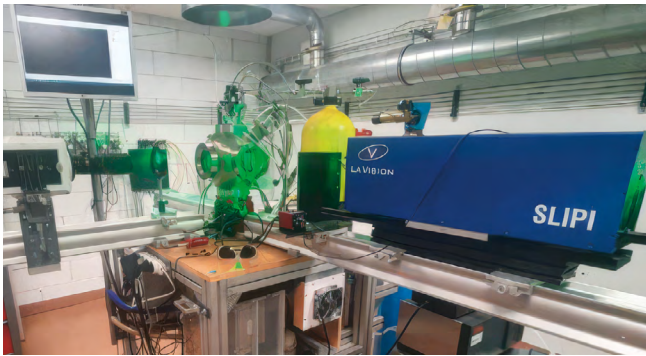


Image Courtesy: "Polarization Ratio with Structured Laser Illumination Planar Imaging for Droplet Sizing in Flash Boiling Ammonia Spray", U. Sonawane et al., ILASS Europe 2025, 33rd Conference on Liquid Atomization & Spray Systems, 31st Aug. - 4th Sept. 2025, Lund, Sweden

With ammonia emerging as a leading carbon-free fuel, understanding its unique spray behavior, which is dominated by flash boiling, rapid evaporation, and strong radial dispersion, is essential. These effects improve mixing but also introduce challenges such as local cooling, making accurate droplet-scale measurements critical.

Conventional optical methods often fail under the dense, highly transient conditions of ammonia sprays. The awarded work shows how LaVision's **SLIPI Droplet Sizing** solution overcomes these limitations by:

- ▶ Suppressing multiple scattering for clear, depth-resolved spray images
- ▶ Providing fast, reliable 2-D droplet size measurements (D_{21})
- ▶ Capturing detailed spatio-temporal evolution of flash-boiling phenomena

Using the highly relevant ECN Spray G 8-hole injector, the researchers revealed how ammonia droplet sizes shrink over time during flash boiling, a key information for optimizing injectors and advancing carbon-free combustion technology.

Why LaVision

LaVision is a global leader in optical measurement technology with decades of experience in spray diagnostics. Our customers benefit from:

- ▶ A modular platform of proven laser imaging tools
- ▶ Powerful in-house DaVis software for real-time analysis
- ▶ Close collaborations with academic & industrial innovators
- ▶ Global support & contract testing services

Ready to upgrade your spray diagnostics?

Request your SLIPI upgrade or schedule an application review!

Data provided by LaVision are believed to be true.
However, no responsibility is assumed for possible inaccuracies or omissions. All data are subject to change without notice.

Jul-26

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