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A parametric investigation of pressurized spray dispersion using laser-induced phosphorescence[1] HERMAN CLERCX, NICO DAM, WILLEM VAN DE WATER, DENNIS VAN DER VOORT, Eindhoven University of Technology — When a high-speed liquid jet exits the nozzle, it breaks up into a cloud of small droplets surrounding the diminishing liquid core, called a spray. The understanding of breakup and dispersion of these sprays has been an experimental and numerical challenge for decades. The large optical density, small scales, and high velocities, result in a small amount of information on the droplet movement in a Lagrangian sense. Using laser-induced phosphorescence (LIP), we can determine the quantitative spreading of a (small) pre-defined spray volume, a direct measure of the spray dispersion. Using a dedicated spray vessel, pressurized up to ambient pressures of 2 MPa (20 bar), this work investigates the change of both radial and axial dispersion of a heptane and water spray through a wide range of parameters. By investigating the dispersion as a function of Reynolds number, Weber number, liquid properties, ambient density, and the spray velocity, indication of the parameters that strongly affect spray dispersion are given. We will discuss the parameters that affect the dispersion, as well as the fundamental differences between spray dispersion and commonly used spray angles.

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