Laser Sheet Dropsizing of DI Sprays under Various Conditions Calibrated Using PDI

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Abstract

It is time consuming for phase Doppler interferometry (PDI) to get the diameter distribution of a plane of the spray though it is quite precise. Laser sheet dropsizing (LSD) is a new laser technique which is based on a planar laser-induced fluorescence (PLIF) and Mie-scattering images originated from a cloud of droplets in a spray. LSD technique could obtain the Sauter mean diameter (SMD) across the spray region simultaneously and quickly by the ratio of the LIF signal to the Mie scattering signal. However, the precision of LSD technique is highly dependent on the calibration. The objective of this paper is to combine these two techniques so as to verify the accuracy of the calibration coefficient K of LSD technique in a wide range of injection pressures and fuel temperatures. Since the LSD technique produces a spatial distribution result while the PDI generates a single-point measurement result with temporal resolution, two comparison methods for the calibration of the coefficient K were conducted. Data conversion between the drop size results of these two measurement techniques were implemented in this paper. The drop size results of PDI and LSD techniques were in a good agreement. After the calibration, the spray SMD distribution can be thoroughly investigated by LSD technique with good temporal and spatial resolutions.

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