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A Laser Sheet Self-Calibration Method for Scanning PIV ANNA N. KNUTSEN, JAMES R. DAWSON, Norwegian University of Science and Technology (NTNU), JOHN M. LAWSON, Max Planck Institute for Dynamics and Self-Organisation, NICHOLAS A. WORTH, Norwegian University of Science and Technology (NTNU) — A laser sheet self-calibration method for scanning PIV has been developed to replace the current laser sheet calibration, which is complex, time consuming and very sensitive to misalignment of the optics or cameras during experiments. The new calibration method is simpler, faster and crucially more robust. The concept behind the method is to traverse a laser sheet through the measurement volume, take a series of images from two different views, and calculate the global 3D particle locations. This information is used to find the real space coordinates of the measurement volume and the orientation and width of the laser sheets. The spatial location of the particles is found by object matching and triangulation. The light intensity in the laser sheet has an approximately Gaussian shape, and the illumination of one particle which will be illuminated multiple times during the scan will thus vary as the sheet is scanned across the measurement volume. The thickness of the laser sheet is calculated by identifying the variation of illumination of the particles during a scan and fitting this to a Gaussian shaped curve, while the orientation is found using a least square fit. The accuracy of the new method will be presented with respect to both synthetic and experimental data.

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