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3-D micro-PIV measurement of microchannel flow using high-speed confocal scanning microscopy HARUYUKI KINOSHITA, MARIE OSHIMA, SHOHEI KANEDA, TERUO FUJII, University of Tokyo — Three-component velocity measurement has been performed for micro flow using a 3-D micro-PIV technique. Sequential volumetric particle images are obtained using a high-speed 3-D confocal scanning microscopy. The present 3-D confocal system consists of a microscope, a Nipkow disk-based multi-spot confocal scanner, a piezo-driven objective positioner, and a high-speed camera. This system can scan the cubic domain of $240 \times 180 \times 25 \mu\text{m}$ in less than 100 milliseconds as changing the position of the confocal plane quickly in the out-of-plane direction by the objective positioner. As the result, we can record time series of 3-D spatial distributions of tracer particles in slow micro flow. All three components of velocity are obtained applying a 3-D PIV algorithm based on the 3-D cross-correlation method to the sequential volumetric images. We have measured a 3-D flow in a microchannel with a step using the 3-D micro-PIV technique. The out-of-plane component of velocity has been measured successfully in addition to the in-plane velocity distribution.

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