Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

3D scanning micro-PIV measurement of micro-round tube flow
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Recently, a number of microfluidic researches were carried out for various fields such as biomedicine, analytical chemistry, chemical synthesis, drug delivery, and so on. In microscopic scale, the dominant factors of fluid dynamics are completely different from those in macro scale: Surface tension and electrical force are bigger than inertia forces. Thus, in order to design microfluidic devices, the understanding of specific physics in microflows is necessary. In this work, the authors suggest a strong measurement instrument for microfluid dynamics. The 3D scanning micro-PIV system was developed in order to measure three-dimensional velocity distributions at micrometer scale resolution. This system consisted of an epi-fluorescence microscope with objective lens, a high-speed CMOS camera with 6000 fps at 512 x 512 pixels, a piezo actuator, and Nd:YAG CW laser. To validate the measurement accuracy of the system, it was applied to 95 μm micro-round tube flow. 3D (three-dimensional: x,y,z) -3C (three-component: u,v,w) velocity distribution of the micro-round tube was obtained at the spatial resolution of 5.4 x 2.7 x 4.2 μm.

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Date submitted: 28 Jul 2005 Electronic form version 1.4