Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Statistical reconstruction of velocity profiles for nano-PIV PETER MUCHA, Mathematics, Georgia Tech, CHRISTEL HOHENEGGER — Velocities and Brownian effects at nano-scales near microchannel walls have been measured by evanescent-wave illumination techniques [R. Sadr et al., J. Fluid Mech. 506, 357-367 (2004)]. Assuming moblility of spherical particles is dominated by hydrodynamic interaction between the particle and wall, and that fluid velocity is directed in one in-plane direction, the out-of-plane dependence of mobility and velocity are clearly coupled. We investigate such systems computationally, using a Milstein algorithm that is both weak- and strong-order 1. We demonstrate that a maximum likelihood algorithm can reconstruct the out-of-plane velocity profile given known mobility dependence and ideal particle identification. We further test this reconstruction for measurements obtained by cross-correlation techniques applied to windowed simulation data. Application to physical data is proposed via analytical results about the influence of Brownian motion in this setting on the correlation peak, combined with simulation results to help identify nearly-optimal parameters.

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Date submitted: 01 Dec 2004 Electronic form version 1.4