Abstract Submitted
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Experimental Verification of Diffusion-Induced Bias in Mean Velocity Using Near-Wall Velocimetry with Quantum Dots[1] S. POUYA, M. KOOCHESFAHANI, Michigan State University, A. GREYTAK, M. BAWENDI, D. NOCERA, Massachusetts Institute of Technology — Results from recent simulations of the Brownian motion of nanoparticles next to a wall have shown that the mean velocity measured from their displacement would tend to overestimate the actual mean fluid velocity depending on the separation time between the two successive realizations of particles. This effect is most serious for highly diffusive nanoparticles. We report experimental verification of this phenomenon by measuring the motion of quantum dots (QDs) within a 100 nm evanescent layer above the surface of a 200 micron microchannel carrying an aqueous solution of QDs in pressure-driven flow. Experimental results are compared with Brownian simulations based on Langevin equations and conditions adopted from the experiment. It is shown that the simulation results agree with the experimental data once the diffusion coefficient in the simulation is matched to the one observed in the experiment.

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