Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Inertial migration of neutrally buoyant particles in Poiseuille flow: An investigation of multiple equilibrium positions. BYOUNGJIN CHUN, TONY LADD, University of Florida — In Poiseuille flow, a neutrally-buoyant particle migrates to a position that is determined by the balance of forces generated by the gradient of the shear rate and interactions of a particle with the container wall. In a cylindrical geometry, uniformly distributed particles migrate to form a stable ring located at approximately 0.6R, where R is radius of the cylinder. However, a recent experiment shows two interesting observations. First, the suspended particles tend to align near the walls to make linear chains of more or less equally-spaced particles. Second, at high Reynolds numbers (Reynolds number is about 1000), an additional inner ring of particles was observed, when the ratio of particle diameter to cylinder diameter was of the order of 1:10. We have therefore investigated inertial migration of the neutrally buoyant particles by the lattice Boltzmann method in the range of Reynolds numbers from 100 to 1000. Our numerical results show linear trains of particles along the axis of the flow, near the equilibrium positions of single particles. At Reynolds number greater than 700, particles were also seen near the center of the duct. We will present a new mechanism to explain these results by comparing the migration of single particles and rigid dumbbells, Reynolds numbers in the range of 100 to 1000.

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Date submitted: 17 Jul 2006 Electronic form version 1.4