Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Multiparticle hydrodynamic interactions in parabolic creeping flow between two parallel planar walls[1] JERZY BLAWZDZIEWICZ, Yale University, SUKALYAN BHATTACHARYA, Texas Tech University, ELIGIUSZ WAJNRYB, IPPT Poland — Hydrodynamic interactions of spherical particles in incident Poiseuille flow in a channel with infinite planar walls are investigated. The particles are suspended in a Newtonian fluid, and creeping-flow conditions are assumed. We consider the motion of freely suspended particles as well as the forces and torques acting on particles adsorbed at a wall. Using our highly accurate Cartesian-representation algorithm, we find that the pair hydrodynamic interactions in this wall-bounded system have a complex dependence on the lateral interparticle distance due to the combined effects of the dissipation in the gap between the particle surfaces and the backflow associated with the presence of the walls. For immobile particle pairs we have examined the crossover between several far-field asymptotic regimes corresponding to different relations between the particle separation and the distances of the particles from the walls. We have also shown that the cumulative effect of the far-field flow substantially influences the force distribution in arrays of immobile spheres. Therefore, the far-field contributions must be included in any reliable algorithm for evaluating many-particle hydrodynamic interactions in the parallel-wall geometry.

[1]Supported by NSF grants CTS-0201131 and CTS-0348175 and NASA grant NAG3-2704

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Date submitted: 12 Aug 2005 Electronic form version 1.4