Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Hydrodynamic Fluctuations in Confined Particle-Laden Fluids

NICOLAS DESREUMAUX, Laboratoire PMMH, ESPCI ParisTech, Universite Paris 6, JEAN-BAPTISTE CAUSSIN, Laboratoire de Physique de l'Ecole Normale Superieure de Lyon, Universite de Lyon, RAPHAEL JEANNERET, Laboratoire PMMH, ESPCI ParisTech, Universite Paris 7, ERIC LAUGA, DAMTP, Centre for Mathematical Sciences, University of Cambridge, DENIS BARTOLO, Laboratoire de Physique de l'Ecole Normale Superieure de Lyon, Universite de Lyon — We address the collective dynamics of non-Brownian particles cruising in a confined microfluidic geometry and provide a comprehensive characterization of their spatiotemporal density fluctuations. We show that density excitations freely propagate at all scales, and in all directions even though the particles are neither affected by potential forces nor by inertia. We introduce a kinetic theory which quantitatively accounts for our experimental findings, demonstrating that the fluctuation spectrum of this nonequilibrium system is shaped by the combination of truly long-range hydrodynamic interactions and local collisions. We also demonstrate that the free propagation of density waves is a generic phenomenon which should be observed in a much broader range of hydrodynamic systems.

Nicolas Desreumaux
Laboratoire PMMH, ESPCI ParisTech, Universite Paris 6

Date submitted: 14 Nov 2013 Electronic form version 1.4