Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Dynamical Density Functional Theory and Hydrodynamic Interactions in Confined Systems[1] BENJAMIN GODDARD, University of Edinburgh, ANDREAS NOLD, SERAFIM KALLIADASIS, Imperial College London — Colloidal systems consist of nano- to micrometer-sized particles suspended in a bath of many more, much smaller and much lighter particles. Motion of the colloidal particles through the bath, e.g. when driven by external forces such as gravity, induces flows in the bath. These flows in turn impart forces on the colloid particles. These bath-mediated forces, known as Hydrodynamic Interactions (HIs) strongly influence the dynamics of the colloid particles. This is particularly true in confined systems, in which the presence of walls substantially modifies the HIs compared to unbounded geometries. For many-particle systems, the many of degrees of freedom prohibit a direct solution of the underlying stochastic equations and a reduced model is necessary. We employ elements from the statistical mechanics of classical fluids, namely Dynamical Density Functional Theory (DDFT) [1,2], the computational complexity of which is independent of the number of particles to include both inter-particle and particle-wall HI and demonstrate the physical importance of using the correct description of HIs in confined systems. In addition, DDFT allows us to isolate and investigate different components of HIs.
[1] Phys. Rev. Lett. 109, 120603 (2012)
[2] J. Phys.: Condens. Matter 25, 035101 (2013)

[1]Supported by EPSRC grant EP/L025159

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Date submitted: 30 Jul 2016 Electronic form version 1.4