Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Particle trajectory entanglement in microfluidic channels ALVARO MARIN, MASSIMILIANO ROSSI, CHRISTIAN KÄHLER, Bundeswehr University Munich — Suspensions in motion can show very complex and counterintuitive behavior, particularly at high concentrations. In this talk we show an overlooked phenomenon occurring when a dilute particle solution is forced to travel in a narrow channel (only a few times the particle size). At critical interparticle distances, particles tend to interlace their trajectories forming a sort of *hydroclusters* only bonded by hydrodynamic interactions. While classical studies on non-Brownian self-diffusivity report average particle displacements of fractions of the particle diameter, the trajectories observed in our system show displacements of several particle diameters. Indeed, such a behavior resemble the deterministic trajectories found by Uspal *et al.* (Nat. Comm. 4, 2013) with engineered particle doublets. Trajectory statistics are obtained for different shear rates and particle sizes. The results are compared with particle dynamics simulations and analyzed under the light of recent studies on the irreversibility of non-Brownian suspensions (Metzger *et al.*, Phys. Rev. E, 2013) to elucidate the nature of the hydrodynamic interactions entering into play. The reported phenomenon could be applied to promote advective mixing in micro-channels or particle/droplet self-assembly.

Alvaro Marin
Bundeswehr University Munich

Date submitted: 29 Jul 2015 Electronic form version 1.4