Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

MicroPIV measurements of flows induced by rotating microparticles near a boundary[1] JAMEL ALI, MINJUN KIM, Drexel University — We report the hydrodynamics induced by single digit micron sized particles rotating in low Reynolds number environments and analysis of their flow fields using MicroPIV. Magnetic microparticles floating a few nanometers above a glass substrate, in an otherwise quiescent fluid, were actuated wirelessly using a rotating magnetic field controlled using two pairs of orthogonally positioned electromagnetic coils. A high-speed camera was used to sufficiently capture the motion of nanometer sized seeding particles at 500 frames per second as well as track the rotation of the microparticles. Analysis of microPIV data revealed good agreement with the analytical solution for flow generated by a sphere in an infinite fluid. Additionally, the sequential flow fields generated by two particles as they approach each other, to form dimers, was also analyzed. It was observed that as two synchronously rotating beads of equal diameter are placed closed together, their flow fields were offset, at their combined center of mass, and superimposed near their outer peripheries. These results suggest that colloidal magnetic particles can be pattered in a manner such that when rotated their generated flow is globally coordinated.

[1]This work is suppored by NSF Grant DRM-1307497

Jamel Ali
Drexel University

Date submitted: 01 Aug 2015 Electronic form version 1.4