Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Magnetic microswimmers: Controlling particle approach through magnetic and hydrodynamic interaction FARSHAD MESHKATI, University of Nevada, Reno, U KEI CHEANG, MINJUN KIM, Drexel University, HENRY FU, University of Nevada, Reno — We investigate magnetic microswimmers actuated by a rotating magnetic field that may be useful for drug delivery, micro-surgery, or diagnostics in human body. For modular swimmers, assembly and disassembly requires understanding the interactions between the swimmer and other modules in the fluid. Here, we discuss possible mechanisms for a frequency-dependent attraction/repulsion between a three-bead, achiral swimmer and other magnetic particles, which represent modular assembly elements. We first investigate the hydrodynamic interaction between a swimmer and nearby particle by studying the Lagrangian trajectories in the vicinity of the swimmer. Then we show that the magnetic forces can be attractive or repulsive depending on the spatial arrangement of the swimmer and particle, with a magnitude that decreases with increasing frequency. Combining magnetic and hydrodynamic effects allows us to understand the overall behavior of magnetic particles near the swimmer. Interestingly, we find that the frequency of rotation can be used to control when the particle can closely approach the swimmer, with potential application to assembly.

Farshad Meshkati
University of Nevada, Reno

Date submitted: 31 Jul 2015 Electronic form version 1.4