Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Controlled microparticle transport in arrays of oscillating probes[1]

KWITAE CHONG, JEFF D. ELDREDGE, University of California, Los Angeles

— A probe of circular cross section, undergoing rectilinear oscillation, creates large-scale steady circulatory cells by viscous streaming. In previous work, we have shown that inertial particles can be trapped inside these streaming cells, regardless of particle size and density and Reynolds number (Chong et al., Physics of Fluids, 2013). In the present work, we extend this study to various arrangements of oscillating probes. High fidelity computations are used to simulate the flow field, and a modified form of the Maxey-Riley equation is used to capture particle transport. It is shown that, by controlling the sequence of starting and stopping the oscillation of individual probes, inertial particles can be transported in a predictable manner between trapping points. In order to reduce the considerable expense of generating the flow field, we also explore the use of steady Stokes flow to serve as an approximate surrogate for the flow between probes. The boundary conditions for this flow are obtained by matching with the inner Stokes layer solution.

[1]Support for this work by the National Science Foundation, under Award Nos. CMMI-0969869 and CMMI-1000656, is gratefully acknowledged.

Kwitae Chong
University of California, Los Angeles

Date submitted: 02 Aug 2013 Electronic form version 1.4