Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Lattice Boltzmann Simulations of Peristaltic Particle Transport KEVIN CONNINGTON, Johns Hopkins University, QINJUN KANG, HARI VISWANATHAN, Los Alamos National Labs, SHIYI CHEN, Johns Hopkins University, AMR ABDEL-FATTAH, Los Alamos National Labs — A peristaltic flow occurs when a tube or channel with flexible walls transports the contained fluid by progressing a series of contraction or expansion waves along the length of those walls. It is a mechanism used to transport fluid and immersed solid particles when it is ineffective or impossible to impose a favorable pressure gradient or desirous to avoid contact between the transported mixture and mechanical moving parts. Peristaltic transport occurs in many physiological situations and has myriad industrial applications. We focus our study on the peristaltic transport of a macroscopic particle in a two dimensional channel using the Lattice Boltzmann Method (LBM). We systematically investigate the effect of variation of the relevant non-dimensional parameters of the system on the particle transport. We examine the particle behavior when the system exhibits the peculiar phenomenon of fluid "trapping." Finally, we analyze how the particle presence affects stress, pressure, and dissipation in the fluid in hopes of determining preferred working conditions for peristaltic transport of shear-sensitive particles.

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Date submitted: 02 Aug 2008 Electronic form version 1.4