Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Modeling flow through inline tube bundles using an adaptive immersed boundary method[1] CHUNLEI LIANG, XIAOYU LUO, University of Glasgow, BOYCE GRIFFITH, New York University — Fluid flow and its exerted forces on the tube bundle cylinders are important in designing mechanical/nuclear heat exchanger facilities. In this paper, we study the vortex structure of the flow around the tube bundle for different tube spacing. An adaptive, formally 2^{nd} order immersed boundary (IB) method is used to simulate the flow. One advantage of the IB method is its great flexibility and ease in positioning solid bodies in the fluid domain. Our IB approach uses a six-point regularized delta function and is a type of continuous forcing approach. Validation results obtained using the IB method for two-in-tandem cylinders compare well with those obtained using the finite volume or spectral element methods on unstructured grids. Subsequently, we simulated flow through six-row inline tube bundles with pitch-to-diameter ratios of 2.1, 3.2, and 4, respectively, on structured adaptively refined Cartesian grids. The IB method enables us to study the critical tube spacing when the flow regime switches from the vortex reattachment pattern to alternative individual vortex shedding.

[1]British Heart Foundation.

Chunlei Liang
University of Glasgow

Date submitted: 29 Jul 2007 Electronic form version 1.4