Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

Computational Co-Design of a Scale-bridging Plasma Simulation Algorithm for Emerging Architectures D.A. KNOLL, W.S. DAUGHTON, B. SRINIVASAN, C.N. NEWMAN, LANL, W.T. TAITANO, Univ. of New Mexico, COCOMANS TEAM — Los Alamos National Laboratory has recently initiated a new project on the topic of Computational Co-design of Multi-scale Algorithms in the Natural Sciences (CoCoMANS). We define computational co-design and the synergistic interaction of Application, Algorithms and Architectures to produce a new class of physics simulation capability. One of our focus application areas will be plasma physics, and one of the goals of the project will be to demonstrate a paradigm shift in plasma kinetic simulation on emerging, heterogeneous computer architectures. We are developing moment-based scale-bridging algorithms with the goal of enabling system scale simulation with self-consistent kinetic effects. These algorithms will be optimized with emerging heterogeneous computer architectures as the target computing platform. In this poster we discuss our computational co-design process, describe the aspects of the moment-based scale-bridging algorithms and the required solver for the stiff moment system. We will provide some algorithmic proof-of-principle, and we will demonstrate the implementation of the general scale-bridging algorithm on a heterogeneous architecture.

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Date submitted: 21 Jul 2011 Electronic form version 1.4