Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Adapting PIC for Memory-Constrained Supercomputers: High-Order Particle Shape for Single-Precision VPIC S. V. LUEDTKE, R. F. BIRD, B. J. ALBRIGHT, Los Alamos National Laboratory — Supercomputers with new architectures require different computational and numerical approaches to obtain optimal performance for the largest plasma simulations. Specifically, particle-in-cell codes require significant modification to run and perform well on present and upcoming GPU-based machines. We report on progress adapting the code VPIC for use on GPU supercomputers as part of ongoing performance-portable efforts utilizing the Kokkos framework. We focus here on the challenges of running large simulations on relatively memory-starved GPUs. High-order particle shape functions can often use far fewer particles without sacrificing simulation fidelity, increasing the size of simulations that can fit in memory. The single-precision nature of VPIC additionally increases the number of particles that can be used. Combining these two features greatly reduces memory footprint, allowing simulations to be run on fewer nodes, reducing communication, or for larger simulations to be run on memory-constrained supercomputers.

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Date submitted: 29 Jun 2020 Electronic form version 1.4