

Abstract Submitted  
for the DPP16 Meeting of  
The American Physical Society

**Speed-limited particle-in-cell (SLPIC) simulation** GREGORY WERNER, JOHN CARY, University of Colorado and Tech-X Corp., THOMAS JENKINS, Tech-X Corp. — Speed-limited particle-in-cell (SLPIC) simulation is a new method for particle-based plasma simulation that allows increased timesteps in cases where the timestep is determined (e.g., in standard PIC) not by the smallest timescale of interest, but rather by an even smaller physical timescale that affects numerical stability. For example, SLPIC need not resolve the plasma frequency if plasma oscillations do not play a significant role in the simulation; in contrast, standard PIC must usually resolve the plasma frequency to avoid instability. Unlike fluid approaches, SLPIC retains a fully-kinetic description of plasma particles and includes all the same physical phenomena as PIC; in fact, if SLPIC is run with a PIC-compatible timestep, it is identical to PIC. However, unlike PIC, SLPIC can run stably with larger timesteps. SLPIC has been shown to be effective for finding steady-state solutions for 1D collisionless sheath problems, greatly speeding up computation despite a large ion/electron mass ratio. SLPIC is a relatively small modification of standard PIC, with no complexities that might degrade parallel efficiency (compared to PIC), and is similarly compatible with PIC field solvers and boundary conditions.

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Date submitted: 15 Jul 2016

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