Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

An Open Source, Parallel Implementation of δf PIC for Beam Simulations.[1] ILYA POGORELOV, CHRISTOPHER HALL, DAVID BRUHWILER, RadiaSoft LLC, GENNADY STUPAKOV, SLAC — Several techniques for cooling light ion beams at high energies rely on amplification or conversion of the density or momentum signature that individual ions imprint on a co-propagating electron beam. The magnitude of such ion-induced density modulation is several orders of magnitude smaller than the local number density in the background electron beam, the energy modulation being similarly subtle, and can be prohibitively expensive to resolve in regular particle-in-cell (PIC) simulations against the backdrop of the discreteness noise in the macroparticle distribution. We implemented, in the open-source plasma and beam physics code Warp, a well known δf PIC technique that offers a solution to this problem by treating the background distribution as a continuous function and representing only the perturbation by variable-weight macroparticles. We use the new capability to simulate the electron momentum signature associated with Debye shielding of co-propagating ions and its subsequent amplification by external magnetic fields.

[1]This work is supported by the U.S. Department of Energy, Office of Science, Office of Nuclear Physics, award No. DE-SC0020592

Ilya Pogorelov
RadiaSoft LLC

Date submitted: 02 Jul 2020 Electronic form version 1.4