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Implicit formulation of the relativistic Vlasov-Maxwell system

KOICHI NOGUCHI, Rice University, GIOVANNI LAPENTA, Los Alamos National Laboratory — High energy particles of many of astrophysical phenomena and laboratory experiments are relativistic. One can study the complexities and long-time behavior of such a problem by using collisionless particle-in-cell (PIC) methods. However, the smallest timescale needs to be resolved in the explicit schemes, and no implicit relativistic scheme have yet been formulated. We present a new relativistic implicit PIC formulation, and compare numerical results with analytical solutions and results from the explicit code. We also extend CELESTE3D into relativistic, and test the new scheme on the magnetic reconnection problem.

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