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Slow Manifold Integrator for Electromagnetic PIC[1] JOSHUA BURBY, LUIS CHACON, GUANGYE CHEN, Los Alamos National Laboratory — Numerical Cherenkov radiation commonly plagues electromagnetic PIC simulations that attempt to use large implicit timesteps for jumping over light waves. We will present a new electromagnetic PIC algorithm designed to overcome this issue when the characteristic speed v for particles is much less than the speed of light c. The scheme is symplectic, implicit, and limits to a consistent scheme for electrostatic PIC at v/c tends to zero. Therefore the scheme is also asymptotics-preserving. We will show that the scheme possesses a discrete-time slow manifold. If a simulation is initialized near this slow manifold then Vlasov-Poisson, Vlasov-Darwin, and higher-order effects can be captured accurately without resolving the light waves. Moreover, knowledge of the discrete-time slow manifold can be exploited to eliminate the stiffness from the nonlinear solve defining a large timestep.

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