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A Variational Formulation of Particle Algorithms for Kinetic E&M Plasma Simulations in the Moving Window[1] ALEXANDER STAMM, BRADLEY SHADWICK, University of Nebraska-Lincoln — The recent variational technique [1] for rigorously deriving discrete, self-consistent equations for electromagnetic particle codes has been further developed in the moving window. The primary advantage of the Lagrangian formulation is the connection between symmetries of the system and conservation laws, which in the present case resolves the grid-heating issue. However, the approach also simplifies coordinate transformations and enables the particle method to be formulated in moving window coordinates. For some laser-plasma interaction scenarios, this leads to computational savings from working in a coordinate system where the evolution of the laser is intrinsically slow. New time advance integrators were developed in this coordinate system and compared to one another; namely, a symplectic method and a split explicit particle and implicit field advance method were developed in the moving window to show the extent of available optimization and improvements over the traditional particle-in-cell (PIC) method. In addition, we examine the phase-space fidelity of our method in cases where the conventional PIC algorithm exhibits unphysical particle trapping [2]. [1] E. G. Evstatiev et al., J. Comput. Phys. **245**, 376 (2013); B. A. Shadwick et al., Phys. Plasmas **21**, 055708 (2014); A. B. Stamm et al., IEEE Trans. Plasma Sci. **42**, 1747 (2014). [2] E. Cormier-Michel et al., Phys. Rev. E **78**, 016404 (2008).

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