Abstract Submitted
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The Physics of Reduced Models of Intense Laser-Plasma Interactions[1] B.A. SHADWICK, UNL, C.B. SCHROEDER, LBNL, J. PAXTON REYES, UNL, CARLO BENEDETTI, E. ESAREY, LBNL — Full-fluid models (wherein the only approximation is the assumption of hydrodynamics) can be computationally intensive in the parameter regimes relevant to advanced accelerator concepts, thus there is interest in evaluating the physics content of reduced descriptions. We present detailed comparisons of the predictions of these models for the case of long propagation of a resonant laser pulse. This configuration is important as it is the primary candidate for a multi-GeV accelerator stage and is the subject of active experimental investigation by a number of groups. Accurate handling of the laser propagation over long distances (order of a thousand plasma oscillations) is essential to assessing the performance of a putative accelerator module. We examine the differences in physics content of these models in regard to laser energy transport, generation of plasma waves, and the role of the wave action adiabatic invariant. We study various numerical concerns such as resolution, convergence, dissipation, dispersion, and computational resource requirements. In particular, we find that proper numerical treatment of the wave operator (reduced or full) is essential to correctly capture the evolution of the laser field.

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