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New Algorithm for Simulation of the Interaction of Intense Laser Light with a Multiscale Plasma[1] BRUCE COHEN, ANDREAS KEMP, LAURENT DIVOL, Lawrence Livermore National Laboratory — The kinetic simulation of the interaction of intense laser light with plasma for fast ignition is challenging. Conventional explicit, particle-in-cell (PIC) methods require temporally resolving the light wave and electron plasma frequencies and spatially resolving the light wavelength, electron Debye length, and skin depth for stability and accuracy. There is also a CFL stability condition on the speed of light. In a fast-ignition plasma, the electron density spans many orders of magnitude. The very underdense plasma is typically collisionless and the very overdense plasma is highly collisional. Fully electromagnetic, explicit PIC algorithms work well up to densities exceeding critical density, but are impractical in the highly overdense region where wave propagation is very restricted. We introduce a two-region algorithm for the simulation of fast ignition. For lower densities, we use an explicit, fully electromagnetic algorithm, and a variant of the explicit algorithm of Davies, et al., for the very overdense plasma using a reduction of Maxwell's equations and an Ohm's law. Spatial smoothing of the electric fields is required. Analysis and demonstrations are presented.

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Bruce Cohen
Lawrence Livermore National Laboratory

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