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Modeling Collisional Effects in PIC Simulations of Laser-Target Interactions[1] W.M. SHARP, M. TABAK, B.C. MCCANDLESS, LLNL — Realistic modeling of laser-target interactions requires a self-consistent representation of collisional effects. While such effects as impact ionization, recombination, and scattering can, in principle, be modeled using particle-in-cell (PIC) methods, the small collision lengths at solid density make this approach impractical. Hybrid-particle models, in which cell-averaged collisional forces are added to a conventional particle advance, allow PIC techniques to be used at higher densities. However, existing implementations of hybrid-particle transport, such as those in LSP and ANTHEM, assume an ideal-gas equation of state (EOS), which seriously misrepresents thermodynamics at solid density. We present a method for using an arbitrary EOS in a hybrid-particle transport model and discuss its implementation in LSP using a quotidian equation of state (QEOS). Results for a 2-D laser-target simulation obtained using this new model are compared with results for an ideal-gas EOS and with experiments.

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