Abstract Submitted
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Development and application of a multi-fluid simulation code for modeling interpenetrating plasmas[1] M. KHODAK, Princeton University, Princeton, NJ 08544, R.L. BERGER, T. CHAPMAN, J.A.F. HITTINGER, Lawrence Livermore Natl Lab — A multi-fluid model, with independent velocities for all species, is developed and implemented for the numerical simulation of the interpenetration of colliding plasmas. The Euler equations for fluid flow, coupled through electron-ion and ion-ion collisional drag terms, thermal equilibration terms, and the electric field, are solved for each ion species with the electrons treated under a quasineutrality assumption. Fourth-order spatial convergence in smooth regions is achieved using flux-conservative iterative time integration and a Weighted Essentially Non-Oscillatory (WENO) finite volume scheme employing an approximate Riemann solver. Analytic solutions of well-known shock tube tests and spectral solutions of the linearized coupled system are used to test the implementation, and the model is further numerically compared to interpenetration experiments such as those of J.S. Ross et al. [Phys. Rev. Lett. 110 145005 (2013)]. This work has applications to laser-plasma interactions, specifically to hohlraum physics, as well as to modeling laboratory experiments of collisionless shocks important in astrophysical plasmas.

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