Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Blended Finite Element Method for Multi-Fluid Plasma Modeling ÉDER SOUSA, URI SHUMLAK, Aerospace and Energetics Research Program, University of Washington — Taking moments of the Boltzmann equation provides equations that govern the evolution of the moments of the distribution function. Generalizing the moment approach to include an arbitrary number of species yields the multi-fluid plasma model. The multi-fuid plasma model is implemented using a blended finite element method (BFEM) through the simultaneous use of continuous and discontinuous Galerkin (CG and DG) spatial discretizations to represent the plasma fluids and electromagnetic fields. The electron fluid and electromagnetic fields are modeled using a nodal CG method while the ion fluids are modeled using modal DG. The approach uses the shock capturing capability of the DG method where appropriate and the computationally efficient CG method for variables that are unlikely to form discontinuities. The variables using the CG representation are associated with the fastest dynamics. To reduce the time step restrictions the CG formulation is integrated in time using an implicit method while the DG time integration is accomplished using a 2nd, 3rd or 4th order Runge-Kutta scheme. The BFEM is implemented into the WARPX (Washington Approximate Riemann Plasma) code framework and is used to study species separation and fuel mixing during ICF implosions of DT capsules.

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Date submitted: 12 Jul 2013

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