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**A Comparison of Fully Implicit and Semi Implicit Time Integration Methods for a 3T Plasma** MATTHEW CALEF, JOHN WOHLBIER, Los Alamos National Laboratory — A common model for dense plasmas represents the radiation, electron and ion energy densities as coupled diffusive quantities. Within this "3T" model the diffusion and coupling coefficients depend on underlying state data yielding non-linear PDEs. One method for integrating these PDEs in time is, at each time step, to use coupling and diffusion coefficients from the previous time step. Further, one may split the time step into smaller sub-steps where each process is advanced independently. While this semi-implicit "operator-split" and "lagged" approach greatly simplifies the numerical problem, the solution is less accurate than the solution obtained from solving the fully implicit coupled system. In this work we present a fully implicit method for integrating in time a coupled "3T" model. Our method employs a geometric multigrid solver with line relaxation for solving the constituent elliptic problems, a preconditioner based on corrected operator-splitting and a Krylov acceleration for converging the nonlinear residual at each update. We compare the result of this method with the results from an operator-split lagged integration method for a "hot spot" problem motivated by a NIF implosion. This problem includes stiff non-linearities and jump discontinuities in diffusion coefficients.

Matthew Calef
Los Alamos National Laboratory

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