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The Semi-implicit Time-stepping Algorithm in MH4D SRINATH VADLAMANI, URI SHUMLAK, GEORGE MARKLIN, ERIC MEIER, PSI-Center, Univ. of Washington, ROBERTO LIONELLO, Science Applications International Corporation — The Plasma Science and Innovation Center (PSI Center) at the University of Washington is developing MHD codes to accurately model Emerging Concept (EC) devices. Examination of the semi-implicit time stepping algorithm implemented in the tetrahedral mesh MHD simulation code, MH4D, is presented. The time steps for standard explicit methods, which are constrained by the Courant-Friedrichs-Lewy (CFL) condition, are typically small for simulations of EC experiments due to the large Alfven speed. The CFL constraint is more severe with a tetrahedral mesh because of the irregular cell geometry. The semi-implicit algorithm [1] removes the fast waves constraint, thus allowing for larger time steps. We will present the implementation method of this algorithm, and numerical results for test problems in simple geometry. Also, we will present the effectiveness in simulations of complex geometry, similar to the ZaP [2] experiment at the University of Washington. References: [1]Douglas S. Harned and D. D. Schnack, Semi-implicit method for long time scale magnetohy drodynamic computations in three dimensions, JCP, Volume 65, Issue 1, July 1986, Pages 57-70. [2]U. Shumlak, B. A. Nelson, R. P. Golingo, S. L. Jackson, E. A. Crawford, and D. J. Den Hartog, Sheared flow stabilization experiments in the ZaP flow Zpinch, Phys. Plasmas 10, 1683 (2003).

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