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Numerical Stability Analysis of Linear Wave Propagation in Extended MHD Modeling[1] YU GAN, Princeton University/ NUF, STEPHEN JARDIN[2], Princeton Plasma Physics Laboratory, Princeton University — Extended MHD (2-fluid) modeling of fusion plasmas using a split semi-implicit time-advance based on a particular high-order finite element with C^1 continuity has been shown to offer significant advantages in efficiency and accuracy[1,2]. However, the method requires the introduction of several viscosity and hyper-viscosity coefficients to provide robust numerical stability. As a code-validation exercise, we report on a systematic study of the simulation of wave propagation in the linear regime. We initialize the simulation in a stable linear eigenmode of the extended MHD equations and follow the evolution to measure the numerical dispersion relation for the 3 sets of MHD waves. We present results showing how the stability, dispersion and dissipation depend on grid size, time step, and the magnitude of the viscosity and hyper-viscosity coefficients. These linear perturbation tests act as useful benchmarks and guides for numerical stability for nonlinear simulations. [1] S. Jardin, J. Comput. Phys. 200 (2004) 133 [2] S. Jardin and J. Breslau, Phys. Plasmas 12, 056101 (2005)

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