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Equilibrium and Stability Calculations in HIT-SI CHRIS HANSEN, GEORGE MARKLIN, THOMAS JARBOE, University of Washington — The PSI-TET equilibrium code solves for solutions to the Ideal MHD equilibrium equation $\mu_0 j = \lambda B$ in arbitrary 3D geometry. A mimetic discretization on a tetrahedral mesh is employed, with up to 3rd order spatial representation. Geometric and polynomial multigrid along with a hybrid MPI/OpenMP parallelism model is used to provide solver scalability. Lambda is allowed to vary across flux surfaces but must be constant in stochastic regions. A scalar flux surface variable is computed by solving an artificial diffusion problem with a large ratio of parallel to perpendicular thermal conductivity. A fixed lambda profile, specified as a function of this flux surface variable, is defined. Equilibria in HIT-SI have been computed for the homogenous (spheromak) and inhomogeneous (injector) fields separately. Combined equilibria of interest with injector driving have also been computed for various lambda profiles. A linearized Ideal MHD module has been developed to evaluate the stability properties of computed equilbria. Equilibrium states and stability analysis will be presented for a range of lambda profiles. Results will also be presented comparing linear to high order Mimetic representations and Mimetic to standard nodal finite element representations. Work supported by DOE.

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