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Nonlinear MHD Simulations of Sheared Flows and Turbulence in the Helimak RUSSELL DAHLBURG, Naval Research Laboratory, JEAN PEREZ, WENDELL HORTON, The University of Texas at Austin, Institute for Fusion Studies — We report results of three-dimensional nonlinear numerical simulations and theory for a magnetohydrodynamic slab model of the Helimak, using magnetic and flow profiles based on experimental data. The Helimak experiment was designed to study the interaction between sheared mass flows and ambient turbulence in a confined plasma. The experiment is well modeled as a bounded magnetized jet in a slab geometry, with no slip boundary conditions in the cross-stream direction, and periodic boundary conditions in the other two directions. In the new nonlinear codewe have developed, space is discretized using a Chebyshev-collocation–Fourier-pseudospectral algorithm. Time is discretized with a third-order Runge-Kutta–Crank-Nicolson scheme. Important features of the code include three spatial dimensions, the presence of walls, and the inclusion of resistivity and viscosity. The nonlinear development of unstable eigenmodes, computed with a Chebyshev-τ algorithm, will be discussed. We analyze the linear results by examining the stresses and perturbed dissipation. Preliminary results show that as the linear modes attain finite amplitude, there is a development of multiscale plasma excitation.

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