Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Nonlinear Evolution of Edge Localized Modes With Flow Shear[1]

D.P. BRENNAN, M.S. CHU, L.L. LAO, P.B. SNYDER, General Atomics, A. PANKIN, D.D. SCHNACK, SAIC, S.E. KRUGER, Tech-X Corp. — A predictive understanding of edge localized modes (ELMs), including onset conditions and dynamic evolution, is crucial to next generation burning plasma experiments such as ITER. A new initiative was formed to study the dynamic evolution of ELMs with the 3D extended MHD code NIMROD. The first objective is to understand the physics of the nonlinear ELM evolution in single fluid extended MHD, with flow shear and anisotropic thermal energy transport. The equilibria employed are unstable only to a robust edge instability with parameters typical of DIII-D H-mode discharges. Linear results compare favorably to linear ideal codes in both mode structure and ballooning/peeling characteristics. The early nonlinear evolution of the mode shows a peak in the energy spectrum at lowest n nonlinearly driven by nearest neighbor coupling of high n modes, followed by energy cascading. The nonlinear mode structure shows filaments of high temperature flowing outward. Resistivity, thermal anisotropy and flow shear modify linear stability and strongly affect the nonlinear evolution.

[1]Work supported by the U.S. DOE under DE-FG03-95ER54309.

D.P. Brennan

Date submitted: 25 Aug 2005 Electronic form version 1.4