Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Edge instabilities in toroidal fusion plasmas[1] LINDA SUGIYAMA, Massachusetts Institute of Technology, HENRY STRAUSS, HRS Fusion, M3D TEAM — Magnetically confined fusion plasmas (tokamaks and spherical torii) can achieve good central confinement by operating in H-mode, using a D-shaped plasma cross-section with a large local pressure gradient at the plasma boundary. Fast electromagnetic instabilites destabilized by the pressure gradient range from large episodic Edge Localized Modes (ELMs) to smaller continuous oscillations; sometimes instability can be completely suppressed. Previous MHD simulations at realistic or near-realistic resistivity, with the M3D code, have shown[1] that large ELMs can drive asymptotic magnetic field splitting around the plasma separatrix, creating a chaotic magnetic tangle in the outer part of the plasma that has important nonlinear effects on the ELM, including on nonlinear growth rates. Additional phenomena, such as plasma toroidal rotation and two-fluid processes, are found to have significant linear and nonlinear effects on the stability and dynamics of both large ELMs and smaller continuous oscillations. Toroidal rotation can be stabilizing and can partially shield the edge perturbation from the plasma interior, as it does for magnetic stochasticity due to applied nonaxisymmetric fields.
[1] L. Sugiyama and H.R. Strauss *Phys. Plasmas* **17** 062505 (2010).

[1]Work supported by the U.S. Department of Energy.

Linda Sugiyama
Massachusetts Institute of Technology

Date submitted: 16 Jul 2010 Electronic form version 1.4