Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Theoretical Origins of Nonresonant m/n=1/1 Modes in Weakly Reversed Shear[1] D.P. BRENNAN, Princeton University, J.M. FINN, Los Alamos National Laboratory, M.R. HALFMOON, University of Tulsa, C.C. KIM, Far-Tech, Inc., A.D. TURNBULL, General Atomics — It is important for us to understand the rich physics of the stability of weakly reversed shear configurations in toroidal confinement experiments. At infinite aspect ratio, a nonresonant $m/n = 1/1$ eigenfunction, delimited within the minimum in $q >\sim 1$, is a stable solution to the MHD stability equation. This non-resonant 1/1 mode has a top-hat structure, and its analysis is mathematically related to that of the usual resonant 1/1 mode with $q < 1$. At finite aspect ratio, this mode is manifested as a continuous coupled component of the stable and unstable modes, becoming the dominant $m = 1$ component as q_{min} approaches unity from above. The coupling to $m > 1$ components varies with aspect ratio. A stable discrete mode exists, surrounded in frequency by a continuum of stable modes. The frequency of the mode approaches marginality with increasing β. The continuum modes are discretized by the discrete computational treatment, but remain identifiable. Energetic particles can resonate with and drive the stable discrete mode unstable. The interaction of the particles with the modes changes the eigenfunction and frequency of the mode, depending on the physics of the particle interaction, giving results in good agreement with previous simulations and experiments.

[1]Supported by DOE Grant DE-SC0004125

D.P. Brennan
Princeton University

Date submitted: 12 Jul 2013

Electronic form version 1.4