Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Resistivity and sheared rotation effects on the toroidal external kink mode A.J. COLE, Columbia University, D.P. BRENNAN, Princeton University, J.M. FINN, Los Alamos National Laboratory — We present PEST-III analysis of the toroidal external kink with plasma resistivity and sheared rotation for a range of equilibria varying elongation, driven unstable by increasing β. The results show that the typical ordering for marginally stable β values is $\beta_{\mathrm{rp,rw}} < \beta_{\mathrm{rp,iw}} < \beta_{\mathrm{ip,rw}} < \beta_{\mathrm{ip,iw}}$, where rp,ip signify resistive or ideal plasma, and iw,rw indicate ideal wall or resistive wall (no-wall). The two resistive plasma β limits are significantly lower than the two ideal plasma values. We vary aspects of the tearing layer physics by means of a variational principle with Padé approximants, and compare with a general computational solution for the layers to gain insight. We also include pressure gradient and local velocity shear within the layers. Global rotation shear Ω' is included in the form of a relative rotation of the $q = 2,\ 3, \cdots$ surfaces and we investigate the resultant effect on the poloidal mode number spectrum. We then present a model for active feedback control, which is the toroidal generalization building on recent results in cylindrical mode control theory [D.P. Brennan and J.M. Finn and submitted to Physics of Plasmas (2014)].

Andrew Cole
Columbia University

Date submitted: 11 Jul 2014 Electronic form version 1.4