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Peeling-Ballooning Mode Analysis in Shifted-Circle Tokamak Equilibria[1] B. BURKE, UW-Madison, S.E. KRUGER, TechX, C.C. HEGNA, UW-Madison, P.B. SNYDER, General Atomics, C.R. SOVINEC, P. ZHU, UW-Madison
— Progress in understanding edge localized modes (ELMs) has been made by investigating the stability properties of edge localized peeling-ballooning modes. We focus on the evolution of ideal MHD modes over a large spectrum in two shifted-circle tokamak equilibria, using the extended-MHD code NIMROD. The TOQ-generated equilibria model a H-mode plasma with a pedestal pressure profile and parallel edge currents. A vacuum region is prescribed by a resistivity profile that transitions from a small to very large value at a specified location. The vacuum model is benchmarked against the linear ideal MHD codes ELITE & GATO. We demonstrate vacuum effects on the stability by adjusting the vacuum location relative to the pedestal pressure region. Ballooning-like instabilities dominate distant vacuum cases, whereas peeling mode physics is expected to dominate as the vacuum approaches the pedestal. Numerical simulations of the early nonlinear stages of edge localized MHD instabilities are presented. Comparisons between equilibria that have "ballooning" dominated instabilities relative to equilibria that are "peeling" dominated are made.

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