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MHD Analysis of the Tokamak Edge Pedestal in the Low Collisionality Regime[1] P.B. SNYDER, K.H. BURRELL, M.S. CHU, T.H. OSBORNE, General Atomics, H.R. WILSON, University of York, C. KONZ, IPP Garching —
The peeling-ballooning model proposes that intermediate wavelength MHD instabilities are responsible for edge localized modes (ELMs) and impose constraints on the pedestal height. In typical discharges with ELMs, the pedestal goes unstable to coupled peeling-ballooning or pure ballooning modes shortly before an ELM is observed. However, at very low collisionality, the bootstrap current in the pedestal region can be large, even very near the separatrix, and the discharge can be most unstable to current-driven kink/peeling modes, typically at relatively low mode number ($n \sim$1-10). Recently, interesting ELM-free regimes, including both Quiescent (QH) and Resonant Magnetic Perturbation (RMP) H-mode, have been observed to occur in this low collisionality regime. Here we systematically explore MHD stability in this regime, including the effects of a conducting wall and sheared toroidal flow. We consider the implications for both RMP and QH discharges, including possible connections between the EHO observed in QH mode and low-n kink/peeling modes.

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