Parameter Scaling of H-Mode Edge Region Stability

J.R. FERRON, L.L. LAO, T.H. OSBORNE, E.J. STRAIT, P.B. SNYDER, A.D. TURNBULL, General Atomics — The observed dependence on discharge shape of the edge-localized-mode (ELM) amplitude and frequency in DIII-D tokamak H-mode plasmas has been shown to be consistent with a model for the pressure gradient \( P'_{\text{edge}} \) stability threshold as a function of toroidal mode number \( n \). In this model, based on ideal MHD stability theory, the instability responsible for triggering a Type I ELM is a coupled kink/ballooning mode with \( n \) near the largest value without access to a second stability regime. Here we add to the understanding of this model through additional parameter scaling studies. The calculated sensitivity to the edge current density \( J_{\text{edge}} \) of the \( P'_{\text{edge}} \) stability threshold versus \( n \) is used to determine the importance of the uncertainty in the measurement of \( J_{\text{edge}} \). The dependence of the \( P'_{\text{edge}} \) threshold on the pressure pedestal width and the total plasma current are compared to experiment. Equilibria characteristic of those at the end of the VH-mode ELM-free phase, when the observed \( P'_{\text{edge}} \) can be especially large, are tested for second stability regime access at low values of \( n \).

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