A27937 Paz-Soldan Webbing Abstract PRL

Density pumpout and edge-localized mode (ELM) suppression by applied n=2 magnetic fields in low collisionality DIII-D plasmas are shown to be correlated with the magnitude of the plasma response driven on the high field side (HFS) of the magnetic axis, but not the low-field side (LFS) midplane. These distinct responses are a direct measurement of a multi-modal magnetic plasma response, with each structure preferentially excited by a different n=2 applied spectrum and preferentially detected on the LFS or HFS. Ideal and resistive MHD calculations find that the LFS measurement is primarily sensitive to excitation of stable kink modes, while the HFS measurement is primarily sensitive to resonant currents (whether fully shielding or partially penetrated). The resonant currents are themselves strongly modified by kink excitation, with the optimal applied field pitch for pumpout and ELM suppression significantly differing from equilibrium field-alignment.