Pedestal Bifurcation and Resonant Field Penetration at the Threshold of Edge-Localized Mode Suppression in the DIII-D Tokamak

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Rapid bifurcations in the plasma response to slowly varying n=2 magnetic fields are observed as the plasma transitions into and out of edge localized mode (ELM) suppression. The rapid transition to ELM suppression is characterized by an increase in the toroidal rotation and a reduction in the electron pressure gradient at the top of the pedestal which reduces the perpendicular electron flow to near zero. These events occur simultaneously with an increase in the inner wall magnetic response. These observations are consistent strong resonant field penetration of n=2 fields at the onset of ELM suppression, based on extended MHD simulations using measured plasma profiles. Spontaneous transitions into (and out of) ELM suppression with a static applied n=2 field indicate competing mechanisms of screening and penetration of resonant fields near threshold conditions. Magnetic measurements reveal evidence for the unlocking and rotation of tearing-like structures as the plasma transitions out of ELM suppression.