Plasma Response to Magnetic Field Perturbations in DIII-D*

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Resonant magnetic perturbations applied to the edge of the DIII-D tokamak [1] are varied in structure and amplitude, while a scanning probe samples the plasma boundary searching for signatures of them in the plasma. The perturbations result in local reduction of up to 50% in n_e and T_e [2] and changes in the dc electric fields near or at the location where magnetic vacuum modelling with TRIP3D [3] predicts resonant structures to be located. Fluctuations and radial turbulent transport are reduced across the perturbed region; the latter mostly due to diminished electric field fluctuations. The probe diagnostics feature high spatial (~1.5 mm) and temporal (1 μs) resolution to search for the effects of the applied resulting resonant or stochastic structures. We chose elliptical, inner-wall-limited, L and OH discharges to perform these experiments due to increased ability to create wider islands, higher resistivity low plasma rotation screening, and to ease probe access. Both n=1 or n=3 perturbations are applied and varied in amplitude and phase to create either well-defined structures at $\psi_n \approx 0.95$ (which are rotated toroidally, resulting in a poloidal shift at the diagnostic location), or a stochastic region.

Modeling of the plasma response has been done using the NIMROD [4] code. The simulations find profile changes due to the unscreened islands, which are compared directly with probe measurements. Adding rotation produces both screening of the islands and a phase shift, which can give the appearance of screening when the island O-point shifts away from the probe location.

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[2] I. Joseph, et al., Nucl. Fusion **48**, (2008) 045009.
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[4] V.A. Izzo, I. Joseph, Nucl. Fusion **48** (2008) 115004.

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