Effects of Resonant Magnetic Perturbations on Edge Density Profile and Fluctuations in DIII-D*

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During application of resonant magnetic perturbations (RMPs), electron density is reduced over a large radial range from r/a=1 into the core. The reduction is not uniform but is a function of radius, with the most significant reduction occurring near the final magnetic island overlap region. In contrast, the density is found to increase in the scrape-off layer, which is consistent with the result from edge reciprocating probe measurement. Interestingly, the density surface near the separatrix location remains nearly unchanged during edge localized modes (ELMs) or during RMP application, that is, there is a density inversion layer at that location. These measurements are made with a high temporal (~50 μs) and spatial resolution (~2 mm in pedestal) profile reflectometer system. These observations imply that either the particle source or transport (or both) is modified by the RMPs. Density fluctuation levels, as measured by FIR scattering and Doppler reflectometry, show significant increases during the RMPs, indicating a potential role for fluctuation induced particle transport. It is also found that the modification of the density profile begins at low magnetic perturbation levels (I-coil current ~1 kA), possibly before the formation of a magnetic stochastic boundary region. Calculations of three-dimensional vacuum magnetic field topology at different times during the RMP current ramp are underway and will be compared to these measurements.

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