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EX/P3-26: Particle Transport Results from Collisionality Scans and Perturbative Experiments on DIII-D

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Recent GYRO simulations predict that particle flux, as a function purely of collisionality, should show a strong increase at low collisionality, but with little change above a critical value, nuˆ˜*0.01. In an L-mode experiment in which collisionality was varied from nu*ˆ˜0.01 to 0.05, little change was observed in the density profile, profile peaking, measured D, V, (obtained using perturbative techniques), or measured fluctuation levels, in agreement with the GYRO predictions made prior to the experiment. This experiment was performed using similarity techniques to vary the collisionality; i.e. the magnetic field B_T was changed from 2.1 to 1.65 T, and heating power was also varied, while matching key dimensionless parameters such as relative gyroradius, beta and safety factor. TGLF and GYRO simulations of the actual experimental discharges are underway. In a second set of experiments, perturbative transport techniques using oscillating gas puffs were utilized to measure D and V in multiple operating regimes, including conventional ELMing H mode, ELM-suppressed operation obtained using resonant magnetic perturbations (RMPs), QH-mode, and L-mode. These experiments provide the first direct measurement confirming an increase in D and decrease in V with RMP application. One important feature of the measurements is that the changes in D and V with RMP application extend deep into the plasma core, past the edge region where the applied RMP fields are expected to directly impact the magnetic field topology. In the plasma core, clear increases in plasma turbulence levels are observed, consistent with TGLF modeling, while ExB shear decreases to a level below the linear growth rate. This work was supported in part by the US Department of Energy under DE-FG02-08ER54984, DE-FC02-04ER54698, DE-FG02-89ER53296, DE-FG02-08ER54999, DE-FG02-05ER54809 and DE-FG02-07ER54917.

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