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Beta Scaling of Turbulence and Transport*

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Experiments on DIII-D have studied the beta dependence of heat transport and fluctuation levels in the hybrid scenario to determine if turbulent transport is primarily electrostatic or electromagnetic. Scans of normalized beta between 1.5 and 2.7 were completed in three regimes: (1) a high-δ plasma shape with low toroidal Mach number, (2) a high-δ shape with high Mach number, and (3) a low-δ plasma shape with high Mach number. A weak beta degradation of the thermal confinement time was observed for all cases, ranging from $B\tau \propto \beta^{-0.1\pm0.3}$ for high rotation to $B\tau \propto \beta^{-0.4\pm0.3}$ for low rotation. The unfavorable beta dependence existed mainly in the electron channel, perhaps indicating magnetic flutter transport. The ion channel had the opposite dependence, making the one-fluid transport nearly independent of beta. Fluctuation data was acquired with the BES, FIR, correlation reflectometers, PCI, and fast ECE diagnostics. The BES data showed small changes in the fluctuation levels during the beta scans, similar to the one-fluid transport results. This data set is being compared to the TGLF transport model. These heat transport results have a slightly more unfavorable scaling than previous experiments on JET [1] and DIII-D [2], but have a more favorable scaling than results reported on ASDEX-Upgrade [3] and JT-60U [4].

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