Transport Dependence on Safety Factor Profile in DIII-D Steady-state Discharges, * C.T. Holcomb, LLNL; J.R. Ferron, T.C. Luce, J.C. DeBoo, GA; A.E. White, MIT; T.L. Rhodes, L. Schmitz, UCLA; F. Turco, ORAU — An analysis of the transport dependence on the safety factor in steady-state scenario discharges is presented based on experimental scans of \( q_{95} \) and \( q_{\text{min}} \) at fixed \( \beta_N \) and \( B_T \). Electron and ion density and temperature decrease with \( q_{95} \). \( T_e \) and \( T_i \) increase and broaden with \( q_{\text{min}} \). Power balance calculations show ion thermal diffusivity \( \chi_i \) increases with \( q_{95} \) and somewhat with \( q_{\text{min}} \), but \( \chi_e \) decreases with \( q_{\text{min}} \). Measured low-k density turbulence increases strongly with \( q_{\text{min}} \) and weakly with \( q_{95} \) in rough agreement with the \( q \)-dependence of \( \chi_i \) but not \( \chi_e \). TGLF drift wave linear stability analysis predicts mid-radius growth rates at all \( k \) decrease with increasing \( q_{95} \) and increase with increasing \( q_{\text{min}} \). This disagrees with the observed \( \chi_i \) increase with \( q_{95} \), is consistent with the increase in \( \chi_i \) with \( q_{\text{min}} \), and is at odds with the observed decrease in \( \chi_e \) with \( q_{\text{min}} \). Calculations of the critical gradient for low-k modes and nonlinear stability analysis with mode coupling will be presented.

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