Pedestal Studies in DIII-D

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Abstract. Studies of the H-mode pedestal in the DIII-D tokamak are presented. The global energy confinement increases as the plasma pressure on top of the pedestal increases. The best empirical description for a pedestal width parameter is $\Delta_{pe} \propto \left(\beta_{pol}^{PED}\right)^{0.4}$ where Δ_{pe} is the width of the electron pressure pedestal and β_{pol}^{PED} is the poloidal beta at the top of the pedestal. The edge profiles of electron density n_e, electron temperature T_e and ion temperature T_i can all have different shapes. Thus, a simple width scaling for the edge might not exist, and studies of the physics of individual profiles have been initiated. A model for the n_e profile, based on self-consistent treatment of edge particle sources and edge particle transport, agrees with several experimental observations. The steep gradient region for the T_e profile often extends further into the plasma than the n_e pedestal step. MHD stability provides the ultimate limits to the evolution of the pedestal and usually leads to edge instabilities called ELMs. However, the absence of ELMs in a regime called the Quiescent H–mode shows that large pedestals can be produced without ELMs.

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