Comparison of pedestal structure and confinement properties in ECRH and NBI heated H-modes in DIII-D

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Abstract

Pedestal characteristics have been compared in DIII-D for pure electron cyclotron resonance heating (ECRH), pure neutral beam injection (NBI) heating, and a combination of the two heating methods. It is shown that when the heat is deposited inside $\rho = 0.5$ the structure of the electron pedestal profiles can be closely matched for discharges with similar heating power and line averaged densities. ECRH plasmas with far off-axis heating, however, have a reduced pedestal electron temperature as compared to NBI plasmas with the same input power and density. This corresponds to a strong reduction in the confinement time and stored energy, as well as a change in the ELM dynamics. Adding ERCH power to an NBI H-mode results in a reduction to the density pedestal height, and changes to the temperature profiles, toroidal rotation profile, and the ELM dynamics. Moving the ECRH deposition radius from $\rho = 0.85$ to $\rho = 0.2$ results in a continuous increase in electron density, T_i pedestal height, and larger T_e from the deposition radius outward to the pedestal. These effects are observed for the limited set of discharges studied; future investigations will determine the robustness of these conclusions with respect to plasma shape, higher injected power levels, and other characteristic parameters.