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Evidence for High Edge Current Density and Its Impact on Plasma Control,[1] T.S. TAYLOR, J.R. FERRON, L.L. LAO, E.J. STRAIT, General Atomics, B.W. RICE, Lawrence Livermore National Laboratory — H–mode discharges are characterized by a large finite pressure gradient, approaching the ideal ballooning limit, extending to the last closed flux surface. This large pressure gradient results in a large bootstrap current localized near the plasma edge. In DIII–D, equilibrium reconstruction of the strongly shaped discharges clearly indicates the high edge current density and the edge current density is directly measured using a 16 channel Motional Stark Effect (MSE) instrument. The average current density between the 95% flux surface and the last closed flux surface approaches the average over the entire discharge. At fixed internal inductance, the required current in the divertor coils to maintain the plasma shape can vary by a factor of two as the edge current is changed from near zero near the boundary to that indicated in the experiment and the flux expansion near the X–point can vary by a factor of two. To properly model H–mode equilibria, current density near the boundary driven by the pressure gradient must be explicitly allowed, and the plasma shape control algorithm must be based on such realistic equilibria.

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