STUDY OF THE CONDITIONS FOR SPONTANEOUS H–MODE TRANSITIONS IN DIII–D

T.N. CARLSTROM and R.J. GROEBNER

A series of scaling studies attempting to correlate the H(high)–mode power threshold (P_{TH}) with global parameters have been conducted. Data from these discharges is also being used to look for dependence of P_{TH} on local edge parameters and to test theories of the transition. Boronization and better operational techniques have resulted in lower power thresholds and weaker density scaling. Neon impurity injection experiments show that radiation also plays a role in determining P_{TH}. A low density threshold for the L(low)-H(high) transition has been linked with the locked mode low density limit, and can be reduced with the use of an error field correcting coil. Highly developed edge diagnostics, with spatial resolution as low as 5 mm, are used to evaluate how the power threshold depends on local edge conditions. Preliminary analysis of local edge conditions for parameter scans of n_e, B_T, and I_p in single-null discharges, and the X-point imbalance in double-null discharges show that, just before the transition to H–mode, the edge temperatures near the separatrix are approximately constant at $100 < T_i < 220$ eV and $35 < T_e < 130$ eV, even though the threshold power varied from 1.5 to 14 MW. During a density scan, the edge ion collisionality, ν_{*i}, varied from 2 to 17, demonstrating that a transition condition as simple as ν_{*i} = constant is inconsistent with the data. The local edge parameters of n_e, T_e, and T_i do not always follow the same global scaling as P_{TH}. Therefore, theories of the L-H transition need not be constrained by these scalings.