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Dimensionless Parameter Scaling for Transport Physics and Performance Extrapolation[1] T.C. LUCE, C.C. PETTY, *General Atomics* — Previous work has demonstrated that the ρ_* (gyroradius normalized to plasma size) scaling of χ is not fixed, but variability is observed only in the ion channel. New results for high-q H–mode and low-q L–mode show ion ρ_* scaling which is Bohm (χ independent of ρ_*). Recent experiments show τ independent of β in both L–mode and H–mode. Proof of the dimensionless parameter scaling approach is to match discharges with identical dimensionless parameters, but different engineering parameters. Global comparisons of DIII–D with JET and C-Mod show very good agreement. Low-q, H–mode discharges in both JET and DIII–D found gyro-Bohm scaling up to the H–mode power threshold. As ρ_* is lowered, the loss power is less than that necessary to maintain H–mode. To match the similarity conditions, sufficient power to induce H–mode is required. The observed ρ_* scaling is consistent with $P_{\rm H} \propto n^{3/4} BS$ where S is the surface area of the plasma, which has a Goldston ρ_* scaling. An ignition point exists which is below the Troyon limit ($\beta_{\rm N} < 3.5$), below the Greenwald limit, and with sufficient power to remain in H–mode for a JET-like plasma ($R = 2.74$ m) at modest magnetic parameters ($B = 5.7$ T, $I = 9.9$ MA).

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