Projections of Gyroradius Scaling Experiments to an Ignition Tokamak

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Abstract

The confinement properties of future magnetic fusion devices can be extrapolated from existing experiments using the scaling of heat transport with relative gyroradius (ρ_*). For H–mode confinement regimes, this extrapolation to smaller ρ_* is complicated by the requirement that the loss power from core transport remain above the H–mode threshold power. If the increase in H–mode threshold power is more rapid than the increase in loss power when ρ_* becomes smaller, then the H–mode threshold determines the scaling of global confinement for large devices rather than core transport. This can be avoided by choosing a scaling path at higher beta along which the loss power remains above the H–mode threshold power to the point of ignition. The parameters for an ignition tokamak plasma that take full advantage of the gyro-Bohm-like scaling of heat transport in H–mode plasmas are presented.