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Category Number and Subject: 5.6.2. DIII-D Tokamak

[ ] Theory [X] Experiment [ ] Combined/General

Scaling of Energy Confinement with Rotation for Advanced Inductive Plasmas in DIII-D,* P.A. Politzer, *General Atomics* – We report the scaling of the energy confinement time in moderately high beta ($2.2 \leq \beta_N \leq 3.3$) advanced inductive plasmas in DIII-D, based on an analysis of a database of 630 discharges that have stationary conditions for ≥ 1 s ($\sim \tau_R$). In dedicated experiments it was found that τ_E decreases by ~40% from the highest to the lowest accessible rotation, prompting this study. Both power-law and offset-linear models are fit to the data, with the rotation represented by either M_A or M_S, the Mach number based on the Alfvén or the sound speed. A power-law ($\tau = C B^{a_B} n^{a_n} ... M^{a_M}$) is the most commonly used model, but there are strong physical arguments for a model that does not yield zero confinement for zero rotation, e.g., offset-linear ($\tau = C_a B^{a_B} n^{a_n} ... + C_b B^{b_B} n^{b_n} ... M$). As there are values in the dataset that fall outside the general trend, the fitting is done by minimizing the mean absolute deviation, a method more robust than the common χ^2 minimization. There is no significant statistical difference between fits using M_A or M_S. Also no significant difference is found between the power-law and offset-linear models.

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