Abstract Submitted
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Impact of Torque and Rotation in High Fusion Performance Plasmas[1] W.M. SOLOMON, Princeton Plasma Physics Laboratory, K.H. BURRELL, R.J. BUTTERY, J.S. DEGRASSIE, A.M. GAROFALO, G.L. JACKSON, T.C. LUCE, C.C. PETTY, P.A. POLITZER, General Atomics, E.J. DOYLE, University of California Los Angeles, F. TURCO, Columbia University — A range of experiments on DIII-D have investigated the role of externally applied torque and the associated toroidal rotation on confinement and stability in plasmas with high levels of normalized fusion performance. In standard H-mode plasmas, the confinement is initially enhanced by increasing rotation, but saturates at intermediate levels of rotation. However, the same effect is observed over a wider range of rotation in advanced inductive plasmas. Both ion and electron confinement improves with high rotation. Surprisingly, experiments in quiescent H-mode (QH-mode) plasmas have found the opposite trend, with improved confinement, performance and reduced turbulence levels at low rotation. The different behavior suggests that $E \times B$ shear, rather than rotation, is needed for improving confinement. In particular, for these QH-mode plasmas, it is found that the $E \times B$ shear near the edge is maintained or enhanced with torque from non-resonant magnetic fields, even at low rotation. In all scenarios, no major difference is observed in confinement whether the plasma is initiated with high rotation and slowed down, or formed with low rotation from the beginning.

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