Mechanisms for Generating Toroidal Rotation in Tokamaks Without External Momentum Input

W.M. Solomon,[1,*] K.H. Burrell,[2] A.M. Garofalo,[2] S.M. Kaye,[1] R.E. Bell,[1] A.J. Cole,[3] J.S. deGrassie,[2] P.H. Diamond,[4] T.S. Hahm,[1] G.L. Jackson,[2] M.J. Lanctot,[5] C.C. Petty,[2] H. Reimerdes,[5] S.A. Sabbagh,[5] E.J. Strait,[2] T. Tala,[6] and R.E. Waltz[2]

[1]*Princeton Plasma Physics Laboratory, Princeton University, Princeton, New Jersey 08543, USA*

[2]*General Atomics, P.O. Box 85608, San Diego, California 92186-5608, USA*

[3]*University of Wisconsin, Madison, Wisconsin 53706-1609, USA*

[4]*Center for Astrophysics and Space Sciences, University of California, San Diego, 9500 Gilman Drive, La Jolla, California 92093-0424, USA*

[5]*Columbia University, New York, New York 10027, USA*

[6]*Association EURATOM-Tekes, VTT, PO Box 1000, FIN-02044 VTT, Finland*

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Abstract

Recent experiments on DIII-D and NSTX have focused on investigating recent mechanisms of driving rotation in fusion plasmas. The so-called intrinsic rotation is generated by an effective torque, driven by residual stresses in the plasma, which appear to originate in the plasma edge. A clear scaling of this intrinsic drive with the H-mode pressure gradient is observed. Coupled with the experimentally inferred pinch of angular momentum, such an edge source is capable of producing sheared rotation profiles. Intrinsic drive is also possible directly in the core, although the physics mechanisms are much more complex. Another option which is being explored is the use of non-resonant magnetic fields for spinning the plasma. It is found, beneficially, that the torque from these fields can be enhanced at low rotation, which assists in spinning the plasma from rest, and offers increased resistance against plasma slowing.

*Electronic address: wsolomon@pppl.gov