Abstract Submitted
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Electromagnetic Torque Measurements in DIII-D through Internal/External Magnetic Field Decomposition[1] E.J. STRAIT, S. MUNARETTO, GA, R.M. SWEENEY, MIT, N.C. LOGAN, A.O. NELSON, PPPL — In a tokamak, spatially resolved 2-axis measurements at the vacuum vessel wall enable a non-axisymmetric helical field to be decomposed into contributions from the plasma and from external sources such as induced wall currents or non-axisymmetric coils [1]. This is a consequence of the more general principle that a vector magnetic field on a closed surface can be separated into contributions from currents internal and external to the surface [2]. A model of the sources is not required. One implication is that the electromagnetic torque on the plasma can be determined directly from conventional magnetic sensors at the wall, equivalent to the better-known Maxwell stress approach [3]. Unlike the Maxwell stress, the present method also enables separate estimates of the internal and external fields responsible for the torque. Examples from DIII-D data show the potential of this technique to illuminate the dynamics of tearing mode locking, and to test theoretical models of the torques from intrinsic and applied external fields. [1] R.M. Sweeney, PoP 2019. [2] A.H. Boozer, NF 2015. [3] N.C. Logan, PPCF 2010.

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