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Measuring viscosity with a resonant magnetic perturbation in the MST RFP RICHARD FRIDSTRÖM, Kungliga Tek Hogskolan KTH, STEFANO MUNARETTO, UW-Madison, LORENZO FRASSINETTI, Kungliga Tek Hogskolan KTH, BRETT CHAPMAN, UW-Madison, PER BRUNSELL, Kungliga Tek Hogskolan KTH, JOHN SARFF, UW-Madison, MST TEAM — Application of an $m = 1$ resonant magnetic perturbation (RMP) causes braking and locking of naturally rotating $m = 1$ tearing modes (TMs) in the MST RFP. The experimental TM dynamics are replicated by a theoretical model including the interaction between the RMP and multiple TMs [Fridström PoP **23**, 062504 (2016)]. The viscosity is the only free parameter in the model, and it is chosen such that model TM velocity evolution matches that of the experiment. The model does not depend on the means by which the natural rotation is generated. The chosen value of the viscosity, about 40 m^2/s, is consistent with separate measurements in MST using a biased probe to temporarily spin up the plasma. This viscosity is about 100 times larger than the classical prediction, likely due to magnetic stochasticity in the core of these plasmas. Viscosity is a key parameter in visco-resistive MHD codes like NIMROD. The validation of these codes requires measurement of the viscosity over a broad parameter range, which will now be possible with the RMP technique that, unlike the biased probe, is not limited to low-energy-density plasmas. Estimation with the RMP technique of the viscosity in several MST discharges suggests that the viscosity decreases as the electron beta increases. Work supported by USDOE.

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