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Measurements of the contribution of Reynolds stress to momentum balance in HSX[1] ROBERT WILCOX, D.T. ANDERSON, J.N. TALMADGE, F.S.B. ANDERSON, University of Wisconsin — It has been predicted that for a sufficiently quasi-symmetric stellarator, the neoclassical viscosity can be small enough that other terms, such as the Reynolds stress drive produced by plasma turbulence, can compete with it in the momentum balance to determine the rotation and radial electric field [1]. In this case, the experimental flows may deviate from values calculated using the ambipolarity constraint by purely neoclassical codes such as DKES and PENTA that are commonly used for stellarators. Using multi-tipped Langmuir probes in the edge of the HSX stellarator, the radial electric field is found to deviate from the values calculated by PENTA, and this deviation corresponds qualitatively to a Reynolds stress flow drive measured via fluctuating floating potential signals. Measurements made at two different locations on the device in regions of high and low magnetic field strength indicate that the local flow drive can change directions depending on the local magnetic geometry. Experiments have been run in both the optimized QHS configuration and a configuration with the symmetry intentionally broken to explore the relationship between the neoclassical viscosity and the measured deviation of the flows from the calculated neoclassical value.

[1] Helander P et al 2008 Phys. Rev. Lett. 101, 145003

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