Abstract Submitted
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**Measurement of ion velocities in the locked Single Helical Axis state in MST RFP plasmas**[1] J. BOGUSKI, M. D. NORNBERG, B. E. CHAPMAN, Univ of Wisconsin, Madison, M. CIANCIOSA, Oak Ridge National Laboratory, D. J. DEN HARTOG, Univ of Wisconsin, Madison, D. CRAIG, Wheaton College, K. J. MCCOLLAM, T. NISHIZAWA, Z. A. XING, Univ of Wisconsin, Madison — Charge Exchange Recombination Spectroscopy (CHERS) provides the first core-localized measurements of the 3D ion flow structure in Single Helical Axis (SHAx) plasmas. In high-current and low-density (large Lundquist number) RFP plasmas, the island associated with the innermost resonant tearing mode can grow to large amplitude and envelop the magnetic axis creating a 3D equilibrium. Measurements of the flow profile with various orientations (phases) of the helical structure relative to the CHERS diagnostic were achieved by locking the plasma with resonant magnetic perturbations. The flows persist despite mode locking, and are correlated with the amplitude and phase of the innermost resonant tearing mode. At mid-radius, a dominantly m=2 poloidal flow structure appears relative to the phase of the helical core. Near the core, non-axisymmetric flows become less pronounced, and cannot be distinguished at the innermost radii. These results place more significant constraints on the nature of the flow structure than previous line-integrated spectroscopy measurements and challenge predictions of visco-resistive MHD models of these helical RFP plasmas.

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