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Testing the role of shear in the Quasi Single Helicity state in MST RFP plasmas J. BOGUSKI, M.D. NORNBERG, S. MUNARETTO, B.E. CHAPMAN, University of Wisconsin - Madison, M. CIANCIOSA, Oak Ridge National Laboratory, P.W. TERRY, D.J. DEN HARTOG, K.J. MCCOLLAM, University of Wisconsin - Madison, J.D. HANSON, Auburn University — In high current and low density (large Lundquist number) RFP plasmas, the island associated with the innermost resonant tearing mode can grow to sufficient width that it envelops the magnetic axis, resulting in a helical axis and a 3D equilibrium. This Quasi Single Helicity (QSH) state has improved core particle and energy confinement and reduced (secondary) tearing mode amplitudes at larger radii. One possible explanation for the decrease in secondary mode amplitudes is the decoupling of secondary modes by the shear (either magnetic or flow) associated with the dominant mode. Analysis of magnetic shear is being pursued through time series reconstructions of QSH plasmas in MST using V3FIT-VMEC, a non-axisymmetric MHD equilibrium solver being applied to stellarators and 3D RFP and tokamak plasmas. Charge Exchange Recombination Spectroscopy will provide the poloidal flow associated with the helical structure. Of interest are correlations between the magnetic and flow shear and the persistence of the QSH state. Both the flow and magnetic field profiles are also important for understanding the non-axisymmetric contribution to the net electric field that may arise as a single-mode dynamo. This material is based upon work supported by the U.S. DOE.

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