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Helical Equilibrium Reconstruction using V3FIT on MST J.J. KOLINER, B.E. CHAPMAN, J.S. SARFF, J.K. ANDERSON, W. CAPECCHI, S. EILERMAN, J.A. REUSCH, UW-Madison, J.D. HANSON, M.R. CIANCIOSA, Auburn, D. TERRANOVA, Consorzio RFX — Plasmas in the MST reversed field pinch bifurcate to a helical equilibrium, forming a Single Helical Axis (SHAx) at high plasma current ($I_p \approx$500 kA) and low density ($n_e \approx 0.5$ x 10^{19} m^{-3}). Modeling of these plasmas requires an equilibrium solver that does not assume axisymmetry. The V3FIT 3D equilibrium reconstruction code is applied to helical equilibria with diagnostic measurements as constraints. The 11-chord interferometer-polarimeter, 22-point Thomson scattering system, and 4-camera soft X-ray probes have been included in addition to external magnetics. Inputs have been adapted for MST's close-fitting conducting shell. Investigations into the role of shell eddy currents have been made, including comparison to eigenfunctions generated from the Newcomb equation. At the plasma boundary, ≈60% of the static n =5 toroidal field B_T seen by magnetic probes is generated by currents in the shell. The generated VMEC equilibrium serves as the input for applications relevant to the 1 MW, 25 keV neutral beam injector. During beam injection, fast ion confinement is reduced in periods with a SHAx compared to axisymmetric plasmas. A single particle orbit code has been applied to calculate particle trajectories in the 3D case, confirming a strong influence of SHAx equilibria on fast ion orbits. EPM magnetic bursts terminate at the transition to SHAx. Alfvén continua have been generated to study this phenomenon with the reduced-MHD code STELLGAP. Work Supported by USDoE and NSF.

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