

Abstract Submitted
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Kinetic Equilibrium Reconstructions of Plasmas in the MAST Database and Preparation for Reconstruction of the First Plasmas in MAST Upgrade¹ J.W. BERKERY, S.A. SABBAGH, Columbia University, L. KOGAN, D. RYAN, CCFE, J.M. BIALEK, Columbia University, L. GUAZZOTTO, Auburn University, Y. JIANG, Columbia University, D.J. BATTAGLIA, PPPL, S. GIBSON, Durham University — Reconstructions of plasma equilibria using kinetic profiles are necessary for stability and disruption analysis of the MAST database, as well as for the upgrade to the device, MAST-U. The VALEN code is used to determine effective resistances in the 3D vessel structures, which are used with nearby loop voltage measurements for estimated currents in the structures during EFIT reconstruction. Kinetic equilibrium reconstructions using all available magnetic sensors, Thomson scattering measurements of electron temperature and density, charge exchange recombination spectroscopy measurements of ion temperature, and internal magnetic field pitch angle measurements from a motional Stark effect diagnostic are performed for a large database of MAST discharges. Excellent convergence errors ($\sim 10^{-8}$) are obtained. Initial inclusion of rotation in the equilibria is performed with the FLOW code. The necessary changes to conducting structure in VALEN, and diagnostic setup in EFIT have been completed for MAST-U, enabling kinetic reconstructions to commence from the first plasma discharges of the upgraded device. Stability projections for MAST-U indicate a substantial gap between the no-wall and with-wall beta limits enabled by passive stabilization plates.

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