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Equilibrium and Stability Calculations of MAST Spherical Torus Plasmas in Preparation for MAST-U, Supporting DECAF[1] J.W. BERKERY, S.A. SABBAGH, J.M. BIALEK, J.D. RIQUEZES, Columbia University, R. AKERS, C. HAM, L. KOGAN, D. RYAN, A. THORNTON, G. XIA, UKAEA, Y. ANDREOPOULOS, A. PICCIONE, University College London, D. BATTAGLIA, Z. WANG, PPPL — Research examining the stability of plasmas in the MAST database utilizing new kinetic equilibrium reconstructions and comparisons to models in the Disruption Event Characterization and Forecasting code (DECAF) is crucial to illuminating relevant physics and enabling long-pulse operation in MAST-U. Progress towards producing kinetic equilibrium reconstructions for the MAST database, and for MAST-U operations, is ongoing. A DECAF model for $\beta_N^{no-wall}$ tested for NSTX is now being utilized for MAST. Machine learning (ML) techniques, including neural networks and random forests have been used to improve the model. Additionally, ideal MHD stability analysis with DCON has begun for the MAST database, enabling these ML techniques to be used for cross-machine comparison. MAST-U projected equilibrium beta scans examined with DCON indicate a no-wall limit around $\beta_N = 4$. The VALEN code, containing a 3D model of the MAST-U conducting structure projects an ideal with-wall limit (β_N~5-6), higher than for MAST, due to enhanced conducting structure. Automated analysis of rotating MHD modes that processes the spectral decomposition of magnetic probe signals for mode discrimination has also been implemented for MAST.

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