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Using Temperature Fluctuation Measurements for Equilibrium Reconstruction and Dynamo Measurement[1] D.J. DEN HARTOG, E. PARKE, J.K. ANDERSON, C.A. JOHNSON, Department of Physics, University of Wisconsin–Madison — The high-repetition-rate Thomson scattering system on MST, in combination with advanced Bayesian statistical methods, enables determination of tearing-mode-correlated temperature fluctuations as small as a few percent of the equilibrium temperature. Tearing mode rational surface locations are determined from the characteristic phase flip observed in temperature fluctuation structures, providing a strong constraint for equilibrium reconstruction. Recent experiments in neutral beam heated plasmas indicate an inward shift of the $m = 1$, $n = 6$ rational surface of approximately 1 cm relative to non-beam heated plasmas. The measured shift of the rational surface enables diagnosis of current redistribution and safety factor modification due to the fast ion population. Additionally, from the phase of correlated temperature fluctuations, the product $<\delta T_e \delta b_r>$is determined. This term is part of $<\delta p_e \delta b_r>$, the divergence of which is often called the kinetic dynamo. The kinetic dynamo emf depends on an imbalance of the radial transport of field-aligned current. Previous measurements of the density fluctuation term $<\delta n_e \delta b_r>$suggest that the kinetic dynamo plays a role in the RFP dynamo process. These measurements of temperature-fluctuation-driven current transport indicate that both terms are needed for a complete picture of the kinetic dynamo.

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