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Laser-Based Faraday-Effect Measurement of Magnetic Fluctuations and Fluctuation-Induced Transport[1] L. LIN, D.L. BROWER, W.X. DING, UCLA, J.S. SARFF, UW-Madison — A multichord far-infrared laser-based Faraday-effect polarimetry diagnostic has been well developed on MST. Combined polarimetry-interferometry capability permits simultaneous measurement of internal structure of density and magnetic field with fast time response ($\sim 4\mu$s) and low phase noise ($< 0.01°$). With this diagnostic, the impact on toroidal current profile from a tangentially injected neutral beam is directly measured, allowing evaluation of non-inductive current drive. In addition, 0.05° Faraday-effect fluctuations associated with global tearing modes are resolved with an uncertainty below 0.01°. For physics investigations, these Faraday-effect fluctuations are complicated by contributions from both density and magnetic fluctuations. In our analysis, the local density fluctuations are obtained by inverting the line-integrated interferometry data after resolving the mode helicity through correlation techniques. The local magnetic fluctuations are then reconstructed using a parameterized fit of the polarimetry data, accounting for both the density and magnetic contributions. For the same mode, density and radial magnetic fluctuations exhibit very different spatial structure. In this process, their relative phase is also determined, thereby allowing the determination of magnetic-fluctuation-induced transport.

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