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Energetic-Particle-Driven Instabilities and Their Effect on Fast Ions in a Reversed Field Pinch[1] L. LIN, W.X. DING, D.L. BROWER, UCLA, J.J. KOLINER, S. EILERMAN, J. REUSCH, J.K. ANDERSON, A.F. ALMAGRI, B.E. CHAPMAN, M.D. NORNBERG, J.S. SARFF, J. WAKSMAN, UW-Madison, D. LIU, UC Irvine — During 1 MW tangential neutral-beam injection (NBI) into the MST reversed field pinch, multiple, bursty instabilities (n=5, 4 and -1) are detected by various fluctuation diagnostics. The spatial structure of associated density fluctuations peaks near the core where fast ions reside. Significant bicoherence among them is measured, indicating nonlinear three-wave coupling. These instabilities are also observed by a laser-based Faraday-rotation diagnostic, containing critical information on the internal magnetic field fluctuations. A tangential-view high-energy neutral particle analyzer (NPA) is used to study the fast-ion population. The measured NPA signal decreases by 15% following NBI-driven instabilities, indicating fluctuation-induced fast-ion transport. The NBI also reduces the amplitude of the innermost-resonant tearing mode by up to 65%. This mode-suppression is lessened following the NBI-driven bursts, consistent with fast ion loss/redistribution weakening the suppression effect.

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Liang Lin
UCLA

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