Abstract Submitted
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Investigation of fast-ion instabilities and tearing-mode reduction during neutral beam injection in a reversed field pinch[1] L. LIN, W.X. DING, D.L. BROWER, UCLA, J.K. ANDERSON, W. CAPECCHI, S. EILERMAN, J.J. KOLINER, M.D. NORNBERG, J. REUSCH, J.S. SARFF, UW-Madison, D. LIU, UC-Irvine — Neutral beam injection into the MST-RFP is observed to drive instabilities that induce fast-ion transport and quench the fast-ion density below classical predictions. These instabilities are detected for both super- and sub-Alfvénic fast ions, indicating that free energy arises from the real space gradient. As plasma current and fast-ion species are changed, the mode number of the dominant instability varies to maintain the wave-particle resonance condition. The dominant instability also exhibits a dependence on fast-ion velocity (v). As v increases, the mode frequency linearly increases and the spatial asymmetry of associated density fluctuations becomes more pronounced. These features link the observed instabilities to continuum modes destabilized by strong drive. In addition to driving instabilities, fast ions are observed to affect intrinsic tearing modes. For certain plasma scenarios, fast ions reduce the core-resonant tearing mode amplitude by 60% while enhancing the kinetic dynamo arising from coherent interactions between density and radial magnetic fluctuations. This implies the potential importance of kinetic dynamo in the tearing mode suppression. Tearing modes can also impact fast-ion redistribution as suggested by edge-resonant tearing mode triggering of a chirping fast-ion mode.

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