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Studies of fast ion confinement in the MST Reversed Field Pinch
D. LIU, A.F. ALMAGRI, J.K. ANDERSON, D.J. DEN HARTOG, S. EILERMAN, M.D. NORNBERG, J.S. SARFF, J. WAKSMAN, UW Madison, G. FIKSEL , Univ. of Rochester, V.V. BELYKH, P. DEICHULI, V.I. DAVYDENKO, A.A. IVANOV, S. POLOSATKIN, N. STUPISHIN , BINP — Studies of fast ion confinement in the MST Reversed Field Pinch (RFP) are performed with a 1 MW hydrogen neutral beam injector (NBI), doped with 3-5% deuterium fuel for creation of beam-target fusion neutrons. It is found that fast ions born from co-current NBI are well confined and roughly consistent with classical behavior in spite of the RFP's stochastic magnetic field. The measured neutron decay times following a $\sim$5 ms NBI pulse approximately agree with the prediction of classical slowing-down theory. The neutron flux at the beam turn-off time increases with plasma density and temperature, also as expected. The estimated fast ion confinement times range from several times to ten times the thermal particle confinement time, and charge-exchange with background neutrals seems to be the dominant fast ion loss mechanism. The slowing-down of fast protons is observed with a multi-energy-channel neutral particle analyzer. These results corroborate previous experiments with very short and low power neutral beam pulses, and are largely in agreement with TRANSP modeling which predicts a centrally peaked fast ion density profile with peak value up to 15% of the plasma density.
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