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Acceleration of fast test ions during magnetic reconnection in the MST RFP S. EILERMAN, J.K. ANDERSON, J.A. REUSCH, M.D. NORNBERG, J. KIM, D.J. DEN HARTOG, University of Wisconsin - Madison, L. LIN, University of California - Los Angeles, J. TITUS, Florida A&M University, D. LIU, University of California - Irvine, G. FIKSEL, University of Rochester, S. POLOSATKIN, V. BELYKH, Budker Institute of Nuclear Physics — Although the mechanism behind anomalous ion heating during periodic magnetic reconnection events in the RFP is not yet fully understood, many features of the energization process or processes have been identified. Recent neutral particle analyzer (NPA) measurements of the acceleration of NBI-born fast ions on MST provide new information about at least one of these energization processes. Modeling shows that the tangentially-viewing NPA primarily measures the parallel component of high-energy, core-localized beam ions. The fast test ions are injected at energies between 8-25 keV and gain between 3-7 keV during a reconnection event. Higher initial energies correspond to higher energy gains, which can be explained by a runaway process in which a parallel electric field is inductively generated by changes in the equilibrium magnetic field. The magnitude of the measured ion acceleration is consistent with a 30 V/m, 100 μs core electric field calculated from equilibrium reconstructions. Ion deceleration of a comparable magnitude is observed during counter-current beam injection in which the inductive electric field opposes the fast ion motion. The NPA will be moved to a radial viewport so that the perpendicular ion velocity can be sampled to gain further insight into the mechanism(s) at work. This work is supported by the US DOE and NSF.

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