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Prize to a Faculty Member for Research in an Undergraduate Institution Talk: Bidirectional outflow jets in the SSX reconnection experiment¹

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Several new experimental results are reported from plasma merging studies at the Swarthmore Spheromak Experiment (SSX) with relevance to collisionless three dimensional magnetic reconnection in laboratory and space plasmas. First, recent high-resolution velocity measurements of impurity ions using ion Doppler spectroscopy (IDS) show bi-directional outflow jets at 40 km/s (nearly the Alfvén speed). Second, ion heating to nearly 10^6 K is observed after reconnection events in a low density kinetic regime. 3D particle simulations reveal a population of trapped ions heated by the outflow. Transient electron heating is inferred from bursts on a 4- channel soft x-ray array. Third, the out-of-plane magnetic field in a reconnection volume shows a quadrupolar structure at the ion inertial scale. Time resolved vector magnetic field measurements on a 3D lattice ($\mathbf{B}(r, t)$) enables this measurement. Each of these measurements will be related to and compared with similar observations in a solar or space context.

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