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High Time Resolution Measurements of Electron Temperature in a Laboratory Plasma VERNON CHAPLIN, DAVID COHEN, MICHAEL BROWN, CHRIS COTHRAN, Swarthmore College — We present 1 μs time resolution calculations of the electron temperature and density of the Swarthmore Spheromak Experiment (SSX) plasma during magnetic reconnection. The non-LTE excitation kinematics code PrismSPECT is used to simulate emission spectra for a variety of plasma conditions. These model spectra are compared to experimental data from two main diagnostics: a vacuum ultraviolet (VUV) monochromator and a low-resolution soft x-ray detector (SXR). Analysis of simulation results reveals that the plasma quickly (< 10 μs) approaches coronal equilibrium conditions in the density regime of interest; as a result we can safely use steady-state simulations for comparisons with the data. Measured UV line strength ratios depend primarily on the electron temperature in the plasma, so we are able to use observations of carbon impurity emission lines in conjunction with SXR measurements as a temperature diagnostic. In particular, the CIII 97.7 nm / CIV 155 nm line intensity ratio proves to be extremely useful, while the CIII 229.7 nm line appears anomalously strong in experimental measurements.

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