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Flow velocity measurements and X-ray imaging of merging flux tubes[1] D. KUMAR, P.M. BELLAN, Caltech — At the Caltech Spheromak Experiment, eight different flux tubes merge to form a collimated axially symmetric plasma jet. The plasma flow velocity in the collimated jet was calculated using the time of flight measurement from the density trace of a heterodyne He-Ne interferometer*. The velocity directly correlates with the toroidal magnetic field created by the axial plasma current through the jet. The plasma jet ingests magnetic helicity and energy into bulk plasma. A longer plasma jet has a larger inductance as it links more flux across itself. Since magnetic energy scales linearly with the plasma inductance, a faster plasma jet is expected to have higher magnetic energy. An energy analysis of the plasma jet is currently underway. The analysis should be applicable to other axially symmetric plasma experiments as well. Magnetic reconnection drives the merging process of the individual flux tubes into the single jet. In the experiment, reconnection is also concurrent with X-ray emission in the EUV/soft X-ray band. A high speed X-ray imaging system is being developed (exposure time $10 - 300$ ns) for imaging the plasma in the EUV band. The small exposure time is expected to give insights into the fast plasma dynamics during the merging of flux tubes.
*D. Kumar, P. M. Bellan, Rev. Sci. Instrum. 77, 083503 (2006)

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