Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Spectroscopic Study on Collimating Plasma Jets: Space- and Time-Resolved Flow Velocity and Electron Density[1] GUNSU S. YUN, PAUL M. BELLAN, Caltech — In the Caltech spheromak experiment, current-carrying plasma jets are generated to study formation of spheromaks and astrophysical jets. High-speed camera images and spectroscopic measurements [1] reveal that the plasma jets are very fast ($\sim 30\ km/s$), collimated and dense (n_e increases from $\sim 10^{20}\ m^{-3}$ to $\sim 10^{22}\ m^{-3}$ during the collimation phase). We believe that the collimation is a result of flow stagnation [1]. If flow decelerates along the jet axis, the toroidal magnetic flux carried by the plasma will pile up like fast traffic running into slower traffic, amplifying the pinch force and thus squeezing the plasma. The spectroscopic system now includes a new device designed to measure jet velocities and densities at multiple positions in a single shot. The device consists of a lens, a diffusing screen, and a linear 12 channel fiber array. The fiber array samples several points on the image of plasma jet formed on the screen by the lens. The new diagnostic will permit observation of velocity and density gradients along the jet axis during the collimation process, thus helping to correlate flow stagnation with density gradient and collimation. [1] S. You, G. S. Yun, and P. M. Bellan, *Dynamic and Stagnating Plasma Flow Leading to Magnetic Flux Tube Collimation*, Phys. Rev. Letter (2005) in press.

[1]Supported by DoE.

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Date submitted: 25 Aug 2005 Electronic form version 1.4