Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Performance of the Plasma Focus with Monolithic Tungsten Electrodes ERIC LERNER, HAMID YOUSEFI, FRED VANROESSEL, ANTHONY ELLIS, IVANA KARAMITSOS, LPPFusion, Inc. — Fusion yield in plasma focus devices scales faster than I^4, where I is peak current, for $I \lesssim 1$ MA, but then appears to plateau at around 1 joule for pure D fill gas. Recent experimental results with the FF-1 plasma focus and new calculations indicate that the cause of this plateau may be metal impurities in the plasma due to increased erosion of the electrodes at higher currents, causing asymmetries that reduce compression in the pinch. To reduce this impurity problem, we are installing in FF-1 monolithic tungsten electrodes, so that no electrical contacts will be inside the vacuum chamber, thus eliminating arcing and minimizing erosion. Tungsten electrodes will also reduce sputtering as compared with the copper electrodes previously used. We expect that this will greatly reduce impurities, preserve filament magnetization and increase density and thus fusion yield of plasmoids using pure D. In addition, we will be using pre-ionization of the fill gas to prevent erosion by runaway electrons when the current pulse is initiated. We will measure the impurity level through timing the speed of the rundown, and through optical spectroscopy, as well by measuring the actual amount of material eroded from the electrodes. Filamentation will be observed with a 4-frame ICCD camera. The dimensions of the plasmoid will be measured both in the optical and with an x-ray pinhole camera. We will report here on the result of initial experiments, including the effects of nitrogen-deuterium mixes, which we expect to further increase density.

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Date submitted: 11 Jul 2014 Electronic form version 1.4