Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Study on the Polarity Riddle of the Dense Plasma Focus[1] SHENG JIANG, ANTHONY LINK, DREW HIGGINSON, ANDREA SCHMIDT, Lawrence Livermore Niational Lab — The dense plasma focus (DPF) Z-pinch devices are capable of producing intense pulses of X-rays and neutrons, thus can serve as portable sources for active interrogation. DPF devices are normally operated with the inner electrode as anode. It has been found that interchanging the polarity of the electrodes can cause orders of magnitude decrease in the neutron yield[1]. The reason for this severe decay remains unclear. Here we use the particle-in-cell (PIC) code LSP[2,3] to model a portable DPF with both polarities. The filling gas is deuterium. The simulations are run in the fluid mode for the rundown phase and are switched to kinetic to capture the anomalous resistivity and beam acceleration process during the pinch. The difference in the shape of the sheath, the voltage and current traces, and the electric and magnetic fields in the pinch region due to different polarities all have great effects on the deuteron ion spectrum, which further determines the neutron yield. A detailed comparison will be presented. 1. G. Decker, W. Kies and G. Pross, Phys. Lett. 89A, 393 (1982) 2. D. R. Welch, D. V. Rose, R. E. Clark, T. C. Genoni, and T. P. Hughes, Comput. Phys. Commun. 164, 183 (2004) 3. A. Schmidt, V. Tang, D. Welch, Phys. Rev. Lett. 109, 205003 (2012)

[1]Prepared by LLNL under Contract DE-AC52-07NA27344 and supported by the Laboratory Directed Research and Development Program (15-ERD-034) at LLNL.

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Date submitted: 15 Jul 2016 Electronic form version 1.4