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Design of a 100 J Dense Plasma Focus Z-pinch Device as a Portable Neutron Source SHENG JIANG, DREW HIGGINSON, ANTHONY LINK, Lawrence Livermore National Laboratory, JASON LIU, University of California, Berkeley, ANDREA SCHMIDT, Lawrence Livermore National Laboratory
— The dense plasma focus (DPF) Z-pinch devices are capable of accelerating ions to high energies through MV/mm-scale electric fields. When deuterium is used as the filling gas, neutrons are generated through beam-target fusion when fast D beams collide with the bulk plasma. The neutron yield on a DPF scales favorably with current, and could be used as portable sources for active interrogation. Past DPF experiments have been optimized empirically. Here we use the particle-in-cell (PIC) code LSP [1,2] to optimize a portable DPF for high neutron yield prior to building it. In this work, we are designing a DPF device with about 100 J of energy which can generate 10^6 – 10^7 neutrons. 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. A scan of driver parameters, anode geometries and gas pressures are studied to maximize the neutron yield. The optimized design is currently under construction. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 and supported by the Laboratory Directed Research and Development Program (15-ERD-034) at LLNL.

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