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Fully Kinetic Simulations of Dense Plasma Focus Z-Pinch ANDREA SCHMIDT, VINCENT TANG, Lawrence Livermore National Laboratory, DALE WELCH, Voss Scientific, LLC — Dense plasma focus (DPF) z pinch devices are sources of copious high energy electrons and ions, x-rays, and neutrons. The mechanisms through which these physically simple devices generate such high energy beams in a relatively short distance are not fully understood. We now have, for the first time, demonstrated a capability to model these plasmas fully kinetically, allowing us to simulate the pinch process at the particle scale. We present here the results of the initial kinetic simulations, which reproduce experimental neutron yields and high energy (MeV) beams for the first time. We present a comparison between fully kinetic, hybrid (kinetic ions/fluid electrons), and fluid simulations. Only fully kinetic simulations predict MeV-energy ions and experimental neutron yields. A frequency analysis of the electric field in the fully kinetic simulation shows plasma fluctuations near the lower hybrid frequency. This suggests the presence of lower hybrid drift instability, a possible contributor to anomalous resistivity in the plasma. 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 (11-ERD-063) at LLNL.

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