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Particle-In-Cell Modeling For MJ Dense Plasma Focus with Varied Anode Shape A. LINK, C. HALVORSON, A. SCHMIDT, LLNL, E.C. HAGEN, NSTEC, D. ROSE, D. WELCH, Voss Scientific — Megajoule scale dense plasma focus (DPF) Z-pinches with deuterium gas fill are compact devices capable of producing 10^{12} neutrons per shot but past predictive models of large-scale DPF have not included kinetic effects such as ion beam formation or anomalous resistivity. We report on progress of developing a predictive DPF model by extending our 2D axisymmetric collisional kinetic particle-in-cell (PIC) simulations to the 1 MJ, 2 MA Gemini DPF using the PIC code LSP. These new simulations incorporate electrodes, an external pulsed-power driver circuit, and model the plasma from insulator lift-off through the pinch phase. The simulations were performed using a new hybrid fluid-to-kinetic model transitioning from a fluid description to a fully kinetic PIC description during the run-in phase. Simulations are advanced through the final pinch phase using an adaptive variable time-step to capture the fs and sub-mm scales of the kinetic instabilities involved in the ion beam formation and neutron production. Results will be present on the predicted effects of different anode configurations. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory (LLNL) under Contract DE-AC52-07NA27344 and supported by the Laboratory Directed Research and Development Program (11-ERD-063) and the Computing Grand Challenge program at LLNL. This work supported by Office of Defense Nuclear Nonproliferation Research and Development within U.S. Department of Energy's National Nuclear Security Administration.

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