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Dense Plasma Focus With High Energy Helium Beams for Radiological Source Replacement ANDREA SCHMIDT, JENNIFER ELLSWORTH, STEVE FALABELLA, ANTHONY LINK, BRIAN RUSNAK, JASON SEARS, VINCENT TANG, Lawrence Livermore National Laboratory — A dense plasma focus (DPF) is a compact accelerator that can produce intense high energy ion beams (multiple MeV). It could be used in place of americium-beryllium (AmBe) neutron sources in applications such as oil well logging if optimized to produce high energy helium beams. AmBe sources produce neutrons when 5.5 MeV alphas emitted from the Am interact with the Be. However, due to the very small alpha-Be cross section for alphas <2 MeV, an AmBe source replacement would have to accelerate $\sim$0.15 μC of He to 2+ MeV in order to produce 10^7 neutrons per pulse. We are using our particle in cell (PIC) model in LSP of a 4 kJ dense plasma focus discharge to guide the optimization of a compact DPF for the production of high-energy helium beam. This model is fluid for the run-down phase, and then transitions to fully kinetic prior to the pinch in order to include kinetic effects such as ion beam formation and anomalous resistivity. An external pulsed-power driver circuit is used at the anode-cathode boundary. Simulations will be benchmarked to He beam measurements using filtered and time-of-flight Faraday cup diagnostics. This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. This work supported by US DOE/NA-22 Office of Non-proliferation Research and Development. Computing support for this work came from the LLNL Institutional Computing Grand Challenge program.

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