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Advanced Design Concepts for Dense Plasma Focus Devices at LLNL[1] ALEXANDER POVILUS, YURI PODPALY, CHRISTOPHER COOPER, BRIAN SHAW, STEVE CHAPMAN, JAMES MITRANI, MICHAEL ANDERSON, ARIC PEARSON, ENRIQUE ANAYA, ED KOH, STEVE FALABELLA, TONY LINK, ANDREA SCHMIDT, Lawrence Livermore Natl Lab — The dense plasma focus (DPF) is a z-pinch device where a plasma sheath is accelerated down a coaxial railgun and ends in a radial implosion, pinch phase. During the pinch phase, the plasma generates intense, transient electric fields through physical mechanisms, similar to beam instabilities, that can accelerate ions in the plasma sheath to MeV-scale energies on millimeter length scales. Using kinetic modeling techniques developed at LLNL, we have gained insight into the formation of these accelerating fields and are using these observations to optimize the behavior of the generated ion beam for producing neutrons via beam-target interactions for kilojoule to megajoule-scale devices. Using a set of DPFs, both in operation and in development at LLNL, we have explored critical aspects of these devices, including plasma sheath formation behavior, power delivery to the plasma, and instability seeding during the implosion in order to improve the absolute yield and stability of the device.

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