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Simulating the Filamentation Instability in Dense Plasma Focus[1] JUSTIN ANGUS, ANTHONY LINK, BRIAN SHAW, STEVE CHAPMAN, CHRIST COOPER, MICHEAL LAVELL, ANDREA SCHMIDT, Lawrence Livermore Natl Lab — A dense plasma focus (DPF) is an open-ended coaxial plasma gun designed to accelerate a plasma discharge down the length of the coax terminating in a Z-pinch configuration on axis. The plasma on axis goes rapidly unstable and can produce a short, intense pulse of neutrons and x-rays when deuterium is used as the working gas. The neutron yield scales strongly with the pinch current. A poor breakdown/lift-off of the plasma along the insulator can lead to current restrikes, diverting current away from the pinch and decreasing the yield. One possible cause of a poor sweep-up of the gas along the insulator is the electro-thermal instability, which can cause the plasma to breakup into individual filaments during the breakdown/lift-off stage. Plasma filamentation has recently been observed in experiments a small-scale (100J) DPF at LLNL. In this work, the filamentation instability during the lift-off stage of a DPF is studied using an extended-magnetohydrodynamic (MHD) model. The filamentation instability wavevector is along the magnetic field. 2D simulations in the R- plane are presented. The results are compared with data from the aforementioned experiments.

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