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MHD modeling of dense plasma focus electrode shape variation[1]
HARRY MCLEAN, CHARLES HARTMAN, ANDREA SCHMIDT, VINCENT TANG, ANTHONY LINK, JEN ELLSWORTH, DAVID REISMAN, Lawrence Livermore National Laboratory — The dense plasma focus (DPF) is a very simple device physically, but results to date indicate that very extensive physics is needed to understand the details of operation, especially during the final pinch where kinetic effects become very important [1]. Nevertheless, the overall effects of electrode geometry, electrode size, and drive circuit parameters can be informed efficiently using MHD fluid codes, especially in the run-down phase before the final pinch. These kinds of results can then guide subsequent, more detailed fully kinetic modeling efforts. We report on resistive 2-d MHD modeling results applying the TRAC-II code to the DPF with an emphasis on varying anode and cathode shape. Drive circuit variations are handled in the code using a self-consistent circuit model for the external capacitor bank since the device impedance is strongly coupled to the internal plasma physics. Electrode shape is characterized by the ratio of inner diameter to outer diameter, length to diameter, and various parameterizations for tapering.

[1] A. Schmidt, et. al., Phys. Rev. Lett, 109(2):205003, 2012

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