Abstract Submitted
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Three-Dimensional Modeling of Capillary Discharge Plasmas for Acceleration and Control of Particle Beams[1] NATHAN COOK, EVAN CARLIN, JOHAN CARLSSON, STEPHEN COLEMAN, RadiaSoft LLC, EDWARD HANSEN, Department of Physics Astronomy, University of Rochester, PAUL MOELLER, ROB NAGLER, RadiaSoft LLC, PETROS TZEFERACOS, Department of Physics Astronomy, University of Rochester — Next generation accelerators aim to achieve unparalleled beam quality, stability, and average power, for which dramatic improvements to the flexibility, control, and precision of beamline components is required. Capillary discharge plasmas are a subset of tailored plasma systems which offer strategic advantages over traditional beamline technologies for accelerating stages, focusing elements, energy compensators, and diagnostics. We present simulations of capillary discharge plasmas in 2D and 3D geometries using FLASH, a publicly-available multi-physics code with sophisticated magneto-hydrodynamic capabilities. We explore novel geometric configurations of capillary structures for use as a laser-plasma accelerator stage, and examine differences in the plasma density steady state resulting from structure, gas, and discharge parameters. We model laser energy deposition to generate sub-channels for the guiding of intense pulses. Lastly, we investigate the use of capillaries for active plasma lenses and present results from benchmark studies. These results are compared against simulation and experimental studies.

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