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Magnetohydrodynamic Modeling of Plasma Channels for Acceleration and Beam Transport

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Structured plasmas present myriad opportunities for acceleration and control of electron and positron beams for advanced concepts accelerators. Modeling these systems is challenging, owing to the orders of magnitude disparities in the spatiotemporal scale lengths between beam or laser and background plasma evolution. We discuss the application of the FLASH code, a publicly available MHD software, to model capillary discharges for use as laser plasma acceleration stages and as active plasma lenses. We discuss system sensitivities to the use of varying initial conidtions, boundary conditions, and transport models. We also consider system scalings for different inputs, including the use of a laser heater. Lastly, we discuss the application of FLASH for modeling a different class of plasma channels known as hydrodynamic optical-field ionized plasmas, which show promise for future meter-scale plasma accelerator sources.

Acknowledgments

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