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FLASH Magnetohydrodynamic Simulations of Experiments to Explore the Generation of Cosmological Magnetic Fields[1] PETROS TZEFERACOS, MILAD FATENEJAD, NORBERT FLOCKE, University of Chicago, GIANLUCA GREGORI, University of Oxford, DONALD Q. LAMB, DONGWOOK LEE, University of Chicago, JENA MEINECKE, University of Oxford, ANTHONY SCOPATZ, KLAUS WEIDE, University of Chicago — Magnetic fields are ubiquitous throughout the universe. However, the origin and strength of these fields are not fully understood. A promising mechanism for the origin of seed fields is the asymmetric shocks that occur in hierarchical structure formation when smaller halos merge to form galaxies and galaxies merge to form clusters of galaxies. The seed fields are generated by the Biermann battery mechanism. The COSMOLAB team of the University of Oxford is conducting experiments to investigate the generation of magnetic fields by asymmetric shocks. These experiments involve the laser illumination of a foil target, driving a shock into a gas-filled chamber, and a variety of plasma and magnetic field diagnostics. In this paper, we describe magnetohydrodynamic simulations of the experiment carried out using the FLASH code. The scientific objective of these simulations is to explore the morphology and strength of the magnetic fields generated by ablation of target material by the laser, and by the jet-like shock that is produced on the opposite side of the target.

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Petros Tzeferacos
University of Chicago

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