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Predictive radiation-MHD simulations with FLASH: Magnetic field generation and turbulent amplification experiments with the Omega EP laser[1] PETROS TZEFERACOS, CHRISTOPHER DALEY, MILAD FATENEJAD, NORBERT FLOCKE, CARLO GRAZIANI, DONALD Q. LAMB, DONGWOOK LEE, ANTHONY SCOPATZ, KLAUS WEIDE, University of Chicago, HUGO DOYLE, GIANLUCA GREGORI, JENA MEINECKE, BRIAN REVILLE, University of Oxford, FRANCESCO MINIATI, ETH Zurich — The process of generation and amplification of Biermann battery magnetic fields is closely linked to the development of turbulence. In an astrophysical environment, a small seed field can be formed in asymmetric supernova remnant blast waves due to misaligned pressure and density gradients. Inhomogeneities in the density distribution can cause the flow to become turbulent and the B-field can be amplified via dynamo action. In this context, the COSMOLAB team will perform experiments using the Omega EP laser at LLE, that represent a scaled-down model of the astrophysical process in a controlled environment. The experiments involve the illumination of a slab-like target, which produces a plasma flow and a Biermann battery field. The flow then propagates through a grid that creates turbulence and amplifies the field. In this study we describe 2D and 3D radiative MHD simulations of the experimental setup, carried out using the FLASH code on Mira (BG/Q) at ALCF. The objective of these simulations is to explore the morphology and strength of the B-fields generated by ablation of target material by the laser, and their amplification due to the grid.

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