FLASH simulations of experiments to explore the generation of cosmological magnetic fields

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Abstract

The FLASH center is engaged in a collaboration to simulate laser driven experiments aimed at understanding the generation and amplification of cosmological magnetic fields using the FLASH code. In these experiments a laser strikes a solid plastic or graphite target launching an asymmetric blast wave into a chamber which contains either Helium or Argon at millibar pressures. Induction coils placed several centimeters away from the target detect large scale magnetic

fields on the order of tens to hundreds of Gauss. The time dependence of the magnetic field is consistent with generation via the Biermann Battery mechanism near the blast wave (G. Gregori, Nature, v. 481, p. 480, 2012). We will discuss several challenges faced in simulating this novel experiment and report results from an ensemble of radiation-hydrodynamic simulations that reveal unexpected features of the experiment which may affect the magnetic field generation.