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Validation and Predictive Radiation-Hydrodynamic Simulations with FLASH: Shock-Generated Magnetic Field Experiments Using the Vulcan Laser Facility at RAL[1] D.Q. LAMB, A. SCOPATZ, P. TZEFERACOS, C. DALEY, M. FATENEJAD, N. FLOCKE, C. GRAZIANI, D. LEE, K. WEIDE, University of Chicago, H. DOYLE, G. GREGORI, J. MEINECKE, B. REVILLE, University of Oxford, F. MINIATI, ETH-Zurich — A promising mechanism for producing seed B fields in the universe is the Biermann battery mechanism (BBM) at asymmetric shocks that occur when galaxies form. The University of Oxford and its collaborators have conducted experiments at the Vulcan Laser Facility at RAL that represent a scaled down version of this process. In these experiments, a 1 ns laser illuminates a carbon rod target in a chamber filled with Ar gas, producing an asymmetric spherical shock wave that generates B fields via the BBM. We report the results of FLASH radiation hydrodynamic simulations of these experiments. The simulations show that the result of the laser illuminating the target is a series of complex hydrodynamic phenomena. We calibrate the fraction of the laser energy that is deposited in the target by requiring that the simulations reproduce the measured shock position r_s at various times for a range of laser energies. Within experimental error, the fraction is independent of laser energy for the range of energies we use to calibrate it. Within calibration error, the simulations are able to predict r_s for considerably smaller and larger energies.

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