Radiation hydrodynamics code ARWEN for simulation of Laboratory Astrophysics

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We present the application of the radiation hydrodynamic code ARWEN to the simulation of Laboratory Astrophysics (LA) systems that include the study of supernovae remnants [1] and radiative shock waves [2,3], both astrophysical objects that can be studied with scaled experiments in laser facilities. Comparison of ARWEN simulations with other codes for the astrophysical scale shows the capability of ARWEN to help in the design of LA experiments, including the validation of the scaling factors between the astrophysical object and the experimental target. The experimental results from LA experiments are fundamental for the validation of the numerical algorithms implemented. The agreement with experiments makes ARWEN a valuable tool for the interpretation of the results and validates the code for its application in the field of High Energy Density Physics, including LA or Inertial Confinement Fusion.

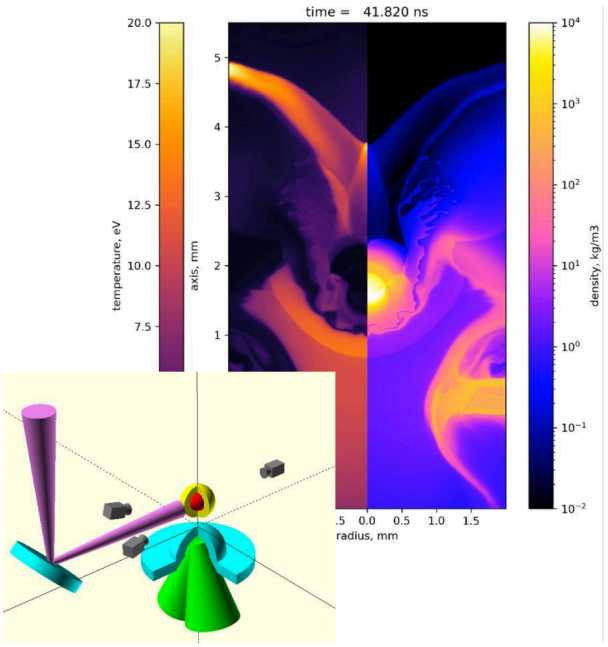

Fig1. Scheme of a LA target (lower panel) to study supernovae remnants and results of the ARWEN simulation (upper panel)

[1] Interaction of hemispherical blast waves with inhomogeneous spheres: Probing the collision of a supernova ejecta with a nearby companion star in the laboratory, García-Senz et al. The Astrophysical Journal, DOI 10.3847/1538-4357/aaf894

[2] First radiative shock experiments on the SG-II laser, Suzuki-Vidal et al. High Power Laser Science and Engineering, (2021), doi:10.1017/hpl.2021.17

[3] Study of Radiative Shocks using 2D Interferometry and XUV Spectroscopy, R. Singh et al. Physics of Plasmas, (in publication)