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Colliding blast waves in the laboratory : a numerical study

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The study of supernovae is an area of great interest in astrophysics. After their explosion, the supernova remnant (SNR) goes through different phases, dispersing its energy into the interstellar medium (Truelove & McKee 1999). At the end of its evolution, the shock behaves like a Taylor-Sedov blast wave. It is during this phase that the SNR may collide with other objects, such as molecular clouds or other SNRs. The development of laboratory astrophysics using high energy density laser experiment has made it possible to reproduce and study those astrophysical phenomena. The collision of such blast waves in the laboratory was performed at the LULI2000 laser facility (Albertazzi et al. 2020). In this work, we reproduce this experiment numerically using the radiative hydrodynamics Arbitrary Lagrangian Eulerian (ALE) code TROLL, in order to study the expansion of these blast waves and their collisions in greater details. As we are simulating the experiment from the moment the laser is fired, this study also enabled us to test the ability of such an ALE code to reproduce the laser-plasma interaction leading to the generation of a blast wave.

Astrophysics Field

Compact objects (supernovae, black holes, neutron stars)

Day constraints

No constraints

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