Scaling properties of astrophysical blast waves and experimental simulations with nanosecond powerful lasers

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Astrophysical blast waves play an important role in the formation of galaxies and stars, in the dynamics of the intergalactic and interstellar media [1]. These structures are mainly associated to violent processes and extreme explosion such as supernova events [2,3]. According to the properties of ambient medium and the source of explosion a great variety of blast wave regimes (Evaporative regime, cosmological regime) can be encountered.

In this study the similarity properties and the scaling laws of nonrelativistic astrophysical blast waves are discussed. The possibility to reproduce similar and analogue laboratory blast waves with nanosecond powerful lasers is developed. We explain the type of experimental data which allow us to constrain the dynamical model of astrophysical media. The possibility to diagnose the development of radiation hydrodynamic instabilities (Rayleigh-Taylor, Richmeyer-Meshkov and cooling instabilities) in these systems is analyzed.

References

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