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## Cosmic Ray Acceleration at Supernovae Occurring in Structured Environments

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Progenitors of some supernovae (especially Type II<sub>n</sub>) are expected to explode in circumstellar environments containing clumps, or shells from previous eruptions. We show that supernovae occurring in such structured environments must be able to accelerate cosmic rays (CR) to high or very-high energies.

In this work, we present a detailed study of the maximum CR energy that can be reached in such systems, and we calculate the amount of energy (per supernova) that can be channelled into CRs. We study the dependence of our results on the parameters of the progenitor star, and on the parameters of the structures in the circumstellar medium.

These high-energy CRs interact with the dense circumstellar gas and produce secondary high-energy neutrinos and gamma-rays. We compute the fluxes of gamma-rays and neutrinos that should be produced by supernovae exploding in such environments.

### Collaboration

– not specified –

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