

The Acceleration and Escape of Particles in Young Supernova Remnants

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Abstract

Combining numerical simulations of supernova remnant (SNR) evolution with a solution of the cosmic-ray transport equation in test-particle mode, we study the acceleration of particles at forward and reverse shocks in both Type Ia and core-collapse SNRs. We include the effect of various magnetic field profiles in the shocked interaction region. We study the temporal evolution of the non-thermal particle distribution, and synthesize surface brightness maps for various radiation mechanisms. We investigate how the spectrum of escaped particles depends on the time-dependent acceleration history in young SNRs, and calculate the time-dependent gamma-ray spectra from molecular clouds illuminated by the escaping cosmic-rays.