EFFICIENT SHOCK ACCELERATION IN YOUNG SUPERNOVA REMNANTS

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The theory of diffusive shock acceleration (DSA) operating in strong, nonrelativistic shocks, clearly allows for the mechanism to be highly efficient. However, it is still an open question if actual collisionless shocks, such as those in young supernova remnants (SNRs), are as efficient as predicted. Fortunately, the nonlinear feedback effects resulting from efficient DSA should produce observable consequences including changes in the morphology of the remnant, lower shocked temperatures relevant to X-ray observations, and a strongly amplified magnetic field. I will outline the theory for nonlinear DSA and apply it to recent observations of young SNRs. Preliminary work on magnetic field amplification will also be presented. This work, which employs a well-tested Monte Carlo simulation, will self-consistently determine the plasma flow, magnetic field, and particle spectrum. Amplified magnetic fields may result in large increases in the maximum particle energy produced in a given shock.