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Time Evolution of Parallel Shock Accelerated Particle Spectrum Bend-over Energy

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Shock acceleration is an important mechanism to accelerate energetic particles. Using test-particle simulations we investigate the time evolution of the accelerated particle energy spectrum in the downstream of a parallel shock with magnetic turbulence. From simulation results we obtain power-law energy spectra with a bend-over energy. It is shown that the bend-over energy increases with time. With the particle mean acceleration time and mean momentum change during each cycle of the shock crossing from the diffusive shock acceleration model, a time-dependent differential equation for the maximum energy of particles accelerated at the shock can be approximately obtained, we assume the model can be used to describe the time evolution of the bend-over energy. It is found that the bend-over energy from simulations agrees well with the theoretical model with the nonlinear diffusion theory.

Keywords

acceleration of particles; shock waves; turbulence

Collaboration

other Collaboration

Subcategory

Theoretical Results

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