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**Particle Acceleration and Energy Conservation in Particle In Cell Simulations** GIOVANNI LAPENTA, STEFANO MARKIDIS, KU Leuven — Particle acceleration is a process of great importance in all areas of plasma physics. In most cases, kinetic effects are dominant and require a full kinetic treatment, such as the Particle in Cell (PIC) method. PIC methods are widely used in all aspects of plasma physics, proving to be a precious and irreplaceable tool. Yet all methods in use and published conserve energy to a good approximation, but not exactly. A well known property of PIC methods, documented extensively in all textbooks, is that energy is not conserved exactly. In fact the particle noise is a unphysical source of energy that, when insufficient resolution is used, can make the simulations go unstable. In the present paper we apply a new exactly energy conserving scheme and demonstrate that indeed exact energy conservation plays a key role in determining the correct spectrum of the accelerated particles.

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