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Particle acceleration in non-relativistic collisionless shocks FREDERICO FIUZA, Lawrence Livermore National Laboratory — Supernova remnant shocks are thought to be the dominant source of cosmic rays up to PeV energies; however, the mechanisms for shock formation, magnetic field amplification and particle acceleration in these scenarios are not yet fully understood. I will present detailed multi-dimensional particle-in-cell simulations of shock formation and particle acceleration in non-relativistic scenarios, both unmagnetized and magnetized. These first principles simulations, for unprecedented temporal and spatial scales, help bridge the gap between fully kinetic and hybrid modeling. The results show that electron acceleration is favored at quasi-perpendicular shocks, whereas ion acceleration is more efficient at quasi-parallel shocks. Moreover, it is possible to observe that in initially unmagnetized plasmas, where the shocks are mediated by the Weibel instability, particle acceleration can also occur. I will discuss the importance of these results for current astrophysical models and the possibility of observing particle acceleration in shocks in near future laboratory experiments.

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