

Fast particle acceleration in 3D hybrid simulations of quasi-perpendicular shocks

Tuesday 14 May 2024 16:50 (5 minutes)

Understanding the conditions conducive to particle acceleration at collisionless, non-relativistic shocks is important for the origin of cosmic rays. We use hybrid (kinetic ions—fluid electrons) kinetic simulations to investigate particle acceleration and magnetic field amplification at non-relativistic, weakly magnetized, quasi-perpendicular shocks. So far, no self-consistent kinetic simulation has reported non-thermal tails at quasi-perpendicular shocks. Unlike 2D simulations, 3D runs show that protons develop a non-thermal tail spontaneously (i.e., from the thermal bath and without pre-existing magnetic turbulence). They are rapidly accelerated via shock drift acceleration up to a maximum energy determined by their escape upstream. We discuss the implications of our results for the phenomenology of heliospheric shocks, supernova remnants and radio supernovae.

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

no

Primary author: ORUSA, Luca (Princeton University)

Co-author: Prof. CAPRIOLI, Damiano (University of Chicago)

Presenter: ORUSA, Luca (Princeton University)

Session Classification: Particle Astrophysics