

Title: The formation of nonrelativistic parallel astrophysical shocks

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Abstract: I will present the preliminary results of our recent large-scale kinetic particle-in-cell studies of the formation of nonrelativistic unmagnetized and magnetized parallel shocks and their long-term evolution. The 2D computer experiments model the collision of two cold plasma slabs for parameters corresponding to supernova remnant shocks. We explore the effects of density asymmetry and of the presence of the guiding magnetic field on the structure of the magnetic turbulence produced in the transition region of the forward and reverse shocks and on the efficiency of particle acceleration. We verify whether nonrelativistic shocks can be mediated via Weibel-type short-wave instability. I will also report on our earlier studies of the feedback of high-energy particles on the microscopic instabilities that govern the formation of a shock.