Abstract Submitted
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Reflected Ion Acceleration by Ion-acoustic Shocks[1] ROALD SAGDEEV, University of Maryland, MIKHAIL MALKOV, PATRICK DIAMOND, UCSD, GALINA DUDNIKOVA, CHUAN LIU, JAY-JAY SU, University of Maryland — Analytic solution for an ion-acoustic collisionless shock with reflected ions is obtained. Its relation to the well known ion-acoustic soliton solution limited by the critical Mach number M 1.6 is clarified. At this Mach number the soliton's electrostatic hump must reflect a sizable fraction of upstream ions. Considering the reflection efficiency first as a free parameter, we construct a new family of shock-like solutions in which the critical Mach number is increased up to M=2 for the Boltzmann electrons and up to M=7 for electrons adiabatically trapped behind the shock. The ions reflected off the shock ramp fill up an expanding precursor, terminated by a double layer type transition at its leading edge. By resolving then the latter transition we obtain the reflection rate appropriate for the given Mach number. The suggested exact solution for the shock transition is limited to a subclass of transitions with no overshoot. We discuss the possible strategies to relax this limitation. Possible applications for the magnetized plasmas in geophysical and astrophysical settings are also considered. The potential of the high-M solitons to generate strong beams of reflected ions is discussed.

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