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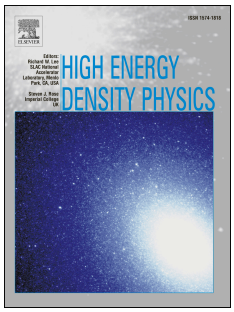

Nonplanar ion-acoustic shock waves in degenerate plasmas with positively charged heavy ion

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Nonplanar ion-acoustic shock waves in degenerate plasmas with positively charged heavy ion

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Abstract

The theoretical and numerical study on the nonlinear propagation of heavy-ion-acoustic (HIA) shock waves has been carried out in an unmagnetized, collisionless dense plasma system (containing degenerate electron and inertial light ion fluids, and positively charged static heavy ions). The normal mode analyse is used to investigate the linear wave properties. Reductive perturbation technique is used to derive the Burgers equation which admits a localized wave solution for the shock profile. It is seen that the shock wave characteristics have been influenced significantly for the non-relativistic as well as for the ultra-relativistic limits. It has also been found that the effect of degenerate pressure and number density of electron and inertial light ion fluids, and positively charged static heavy ions significantly modify the basic features of HIA shock waves. The relevance of our results in astrophysical objects like white dwarfs and neutron stars, which are of scientific interest, is briefly discussed.

Keywords: Heavy-ion-acoustic waves, Shock waves, Degenerate pressure, Nonplanar geometry, Relativity, Compact objects.

1. Introduction

Most of the observable matter in the Universe, over almost all of the history of the universe, is in the plasma state. In astrophysical plasma, the term compact object is used to refer to objects which are small for their mass. In

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