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Effects of Positron Concentration and Temperature on Ion-Acoustic Solitons in Magnetized Electron-Positron-Ion Plasma

Authors : S. K. Jain, M. K. Mishra

Abstract : Oblique propagation of ion-acoustic solitons in magnetized electron-positron-ion (EPI) plasma with warm adiabatic ions and isothermal electrons has been studied. Korteweg-de Vries (KdV) equation using reductive perturbation method has been derived for the system, which admits an obliquely propagating soliton solution. It is found that for the selected set of parameter values, the system supports only compressive solitons. Investigations reveal that an increase in positron concentration diminishes the amplitude as well as the width of the soliton. It is also found that the temperature ratio of electron to positron (γ) affects the amplitude of the solitary wave. An external magnetic field do not affect the amplitude of ion-acoustic solitons, but obliqueness angle (θ), the angle between wave vector and magnetic field affects the amplitude. The amplitude of the ion-acoustic solitons increases with increase in angle of obliqueness. Magnetization and obliqueness drastically affect the width of the soliton. An increase in ionic temperature decreases the amplitude and width. For the fixed set of parameters, profiles have been drawn to study the combined effect with variation of two parameters on the characteristics of the ion-acoustic solitons (i.e., amplitude and width). The result may be applicable to plasma in the laboratory as well as in the magnetospheric region of the earth.

Keywords : ion-acoustic solitons, Korteweg-de Vries (KdV) equation, magnetized electron-positron-ion (EPI) plasma, reductive perturbation method
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