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Electron acoustic shocks in superthermal magnetoplasma with anisotropy and rotational effects

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The study of electron acoustic waves (EAWs) has grown to climax in the past few years because of their presence in various plasma systems ranging from laboratory generated plasmas to numerous astrophysical space plasmas[1]. EASWs are the result of two distinct electron components at different temperatures. Depending upon the temperature difference, the cold electrons become inertial and hot electrons provide the necessary pressure to develop the restoring force for the EAWs to exist likewise the ion acoustic waves (IAWs) in electron-ion plasma where the inertia is provided by the massive ions and the inertialess electrons provide the restoring force. Coriolis force plays a dominant role in cosmic phenomena[2,3] and in many other plasma environments including rotating plasma in laboratory devices as well as in space plasmas. It is found that the Coriolis force has an effective magnetic Field-like effect in a rotating plasma[4]. In Our present work, we have considered a magneto-rotating e-p-i-plasma consisting of nonthermal electrons and positrons following a non-Maxwellian distribution along with cold electrons being dynamical species and massive ions to provide a stationary background for the existence of EASWs with anisotropy and rotational effects. In this investigation reductive perturbation method is employed to derive the Korteweg de Vries Burger (KdVB) equation which describes the dynamics of the electron acoustic shock structures in the multicomponent plasma. With increasing the strength of coriolis force the phase velocity increases. This further modifies the shock structure for different values of the coriolis force (See fig.1).

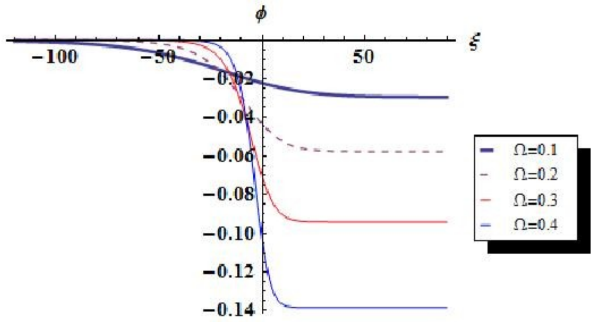

Fig.1 Variation of shock wave profile (ϕ) with ξ for different values of Coriolis force parameter (Ω)

The investigation may be beneficial in understanding the nonlinear electrostatic EASWs in the laboratory and in astrophysical/space plasmas, such as in magnetospheric, ionospheric, solar wind etc.

References

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