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Research area: Plasma Physics

Study of electron acoustic shock fronts and solitary profiles in a semi-classical Plasma

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Abstract

We have used the one-dimensional Quantum Hydrodynamic (QHD) model to investigate electron acoustic solitary wave structures in two-temperature (hot and cold) electron plasmas. With the help of the perturbation expansion technique, a linear dispersion relation has been derived. We have made an attempt to study the dependency of dispersion relation and damping factor with the viscosity coefficient, η. Analytical solution of the KdV-Burgers equation has been carried out by using the reductive perturbation technique. From this solution, shock fronts and solitary profiles alongwith the parametric dependence of the quantum diffraction parameter (H) and viscosity coefficient (η) have been studied. We find that the solitary profiles for both η and H exhibit some similarity as, although the widths vary, the amplitudes remain constant. For H, the classical limit approach has a more prominent effect on the curve.