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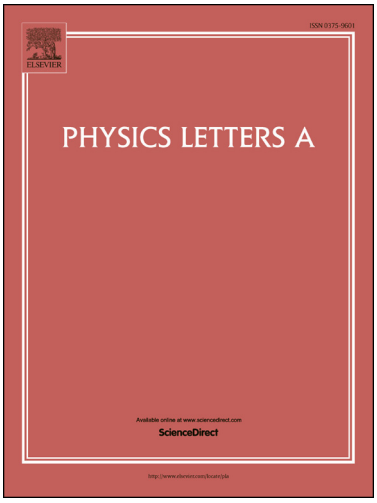

Bifurcation analysis for ion acoustic waves in a strongly coupled plasma including trapped electrons

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Bifurcation analysis for ion acoustic waves in a strongly coupled plasma including trapped electrons.

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Abstract

The nonlinear ion acoustic wave propagation in a strongly coupled plasma composed of ions and trapped electrons has been investigated. The reductive perturbation method is employed to derive a modified Korteweg– de Vries–Burgers (mKdV–Burgers) equation. To solve this equation in case of dissipative system, the tangent hyperbolic method is used, and a shock wave solution is obtained. Numerical investigations show that, the ion acoustic waves are significantly modified by the effect of polarization force, the trapped electrons and the viscosity coefficients. Applying the bifurcation theory to the dynamical system of the derived mKdV–Burgers equation, the phase portraits of the travelling wave solutions of both of dissipative and non-dissipative systems are analyzed. The present results could be helpful for a better understanding of the waves nonlinear propagation in a strongly coupled plasma, which can be produced by photoionizing laser-cooled and trapped electrons [1], and also in neutron stars or white dwarfs interior.

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