One dimension PIC simulation of nonlinear ion-acoustic waves in plasma

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Abstract
In this paper with use of Particle in Cell (PIC) simulation method in one dimension the dynamic of ion acoustic soliton is studied. In this method the ions are monitored as particles and the electrons are assumed to be in thermal equilibrium. The dispersion relation of ion acoustic waves is investigated. The results are in good agreement with analytical results showing that in linear regime our code works correctly. Considering the solution of nonlinear KdV equation as initial perturbation, the propagation of ion acoustic soliton is studied. It is shown that the shape and the velocity of ion acoustic soliton is preserved during propagation through the plasma.

Keywords: dispersion relation, ion acoustic soliton, ion phase space, particle in cell simulation, thermal equilibrium

For full article, refer to the Persian section.