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Effect of electron beam on the characteristics of nonlinear structures in a multicomponent superthermal plasma

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The observations of inertial, drifting charged particles penetrating in various space and astrophysical plasma environments have led the researchers to investigate the influence of charged particle beams on nonlinear waves and structures formed in such environments. It has been indicated that the injection of drifting electrons in the upper layers of Earth's magnetosphere is caused by the solar wind. These electrons are considered to perturb the magnetospheric plasma and give rise to nonlinear waves and modify conditions for the existence of solitary structures. Moreover, the observations of GEOTAIL spacecraft in the Earth's auroral region signify that the broadband electrostatic noise in this region is associated with the nonlinear electrostatic solitary waves that might be related to the dynamics of electron beam instability. It has been reported by various satellite observations that certain high temperature plasmas present in space obey non-Maxwellian distributions instead of Maxwellian. One such non-Maxwellian distribution is the famous kappa distribution that is used by plasma physicists to fit the velocity distribution of superthermal charged particles. The motivation of this investigation is to study the ion acoustic solitary waves in a plasma comprising warm inertial ions, superthermal kappa-distributed hot electrons penetrated by an inertial electron beam. Using the reductive perturbation method, KdV, mKdV and Garner equations are dericed to study the ion acoustic nonlinear structures in a superthemal plasma invaded by an electron beam. The combined effects of an electron beam and variation in different physical parameters on the properties of ion acoustic nonlinear structures such as Gardner solitons and double layer have been analyzed. The findings of this investigation might be useful to understand the propagation of ion acoustic structures in different space and astrophysical plasma environments penetrated by an electron beam.

1. Nimardeep Kaur, Kuldeep Singh and N. S. Saini, Effect of ion beam on the characteristics of ion acoustic Gardner solitons and double layers in a multicomponent superthermal plasma," *Phys. Plasmas*, **24**, 29 August 2017, 092108 (1-11), doi: 10.1063/1.5000051.

2. A. Danhekar, "Electron beam-plasma interaction and electron-acoustic solitary waves in a plasma with suprathermal electrons," *Plasma Phys. Cont. Fusion*, **60**, 26, April 2018, doi: 10.1088/13616587/aabc40.