Seminar

Institute for Plasma Research

Title : Some Problems on Nonlinear Ion Acoustic Waves in Two Electron Temperature Plasma

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Date : 21st June 2021 (Monday)

Time : 03:30 PM

Venue : Online - Join the talk:
https://meet.ipr.res.in/Dr.SandipDalui_PDFtalk

Abstract :

We have considered a collisionless unmagnetized / magnetized plasma composed of warm adiabatic ions and two distinct populations of electrons at different temperatures − the hot electron species follows the nonthermal distribution as prescribed by Cairns et al. [1] whereas the cold electron species obeys the isothermal Maxwell-Boltzmann distribution. We [2, 3, 4] have investigated different nonlinear ion acoustic waves, giving special emphases on the nonlinear wave modulation in both unmagnetized and magnetized plasma. In particular, we have derived different nonlinear Schrödinger equations depending on the direction of the propagation of the ion acoustic waves in magnetized or unmagnetized plasma. Also, we have investigated the relation between two nonlinear Schrödinger equations - one describes the amplitude modulation of ion acoustic waves propagating obliquely to the direction of the magnetic field and other describes the amplitude modulation of ion acoustic waves propagating along the magnetic field.
Again, we [5] have studied the effect of linear Landau damping of electrons on ion acoustic solitary waves in a collisionless unmagnetized plasma consisting of warm adiabatic ions, nonthermal hot electrons and isothermal cold electrons. We have seen that the amplitude of the ion acoustic solitary wave decreases with time.
Finally, using Sagdeev pseudo-potential technique, we [6] have investigated the arbitrary amplitude ion acoustic solitons, double layers and supersolitons in a collisionless magnetized plasma consisting of warm adiabatic ions, nonthermal hot electrons and isothermal cold electrons. Here, we have used the phase portraits of the dynamical system to confirm the existence of different solitary structures. We also investigated the transition of different solitary structures: soliton (before the formation of double layer) → double layer → supersoliton → soliton (after the formation of double layer).

References:

1. R. A. Cairns, A. A. Mamum, R. Bingham, R. Bostr ¨om, R. O. Dendy, C. M. C. Nairn, and P. K. Shukla. *Geophys. Res. Lett.*, **22**, 2709 (1995).
2. Sandip Dalui, Anup Bandyopadhyay and K. P. Das. *Phys. Plasmas* **24**, 042305 (2017). http://dx.doi.org/10.1063/1.4980837
3. Sandip Dalui, Anup Bandyopadhyay and K. P. Das. *Phys. Plasmas* **24**, 102310 (2017). https://doi.org/10.1063/1.4991806
4. Sandip Dalui and Anup Bandyopadhyay. *Astrophys. Space Sci.* **364**, 182 (2019). https://doi.org/10.1007/s10509-019-3672-3
5. Sandip Dalui and Anup Bandyopadhyay. *Indian J. Phys.* **95**, 367 (2021). https://www.doi.org/10.1007/s12648-020-01731-5
6. S. Dalui, S. Sardar and A. Bandyopadhyay. *Zeitschrift für Naturforschung A* (2021). https://doi.org/10.1515/zna-2020-0296