8th Asia-Pacific Conference on Plasma Physics, 3-8 Nov, 2024 at Malacca

Magnetosonic Solitary Waves in (r, q) Distributed Space Plasmas

Navaira Izhar and M. N. S. Qureshi

Department of Physics, GC University, Lahore 54000, Pakistan
e-mail (speaker): navaira.428@gmail.com

In this paper, propagation characteristics of obliquely propagating nonlinear magnetosonic waves in hot nonthermal plasmas have been studied. The expression of modified temperature has been derived for non-Maxwellian (r, q) distribution and then incorporated in the one-fluid magnetohydrodynamic (MHD) model. By employing the reductive perturbation technique, we derived the linear dispersion relation (LDR) and nonlinear Kadomstev-Petvashvilli (KP) equation for slow and fast magnetosonic wave modes in two dimensions. We then investigated the LDR and nonlinear propagation of KP solitons for both the slow and fast mode magnetosonic waves. We found that linear frequency remains maximum for the distributions with high energy tail and spikier peak at low energies but remains minimum for distribution with flat top at low velocities for the same value of wave number. However, the linear frequency is much higher for FM as compared to the SM for the same value of wave number. For the nonlinear propagation, we found that the range of wave numbers for which FM KP solitons propagate is maximum for spiky distribution with high energy tail and for SM KP solitons it is maximum for (r, q) distribution with maximum flat top. We also found that the maximum amplitude of FM KP solitons is higher for (r, q) distribution with maximum flat top whereas the maximum amplitude of SM KP solitons is higher for (r, q) distribution with spiky peak. The results presented here would depict a realistic picture of the propagation of nonlinear magnetosonic waves in non-Maxwellian plasmas.