Nonlinear ion acoustic waves in dissipative and dispersive magneto-rotating relativistic plasmas with two temperature kappa distributed electrons

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A study has been presented for the nonlinear features of ion-acoustic (IA) shock waves in a magnetorotating plasma consisting of warm viscous streaming ions along with kappa-distributed electrons having two different temperatures. In this regard, we have employed the reductive perturbation technique to derive the Zakharov-Kuznetsov-Burgers (ZKB) equation that governs the dynamics of IA shock waves. The solution obtained by the hyperbolic tangent method has been shown to depend on various plasma parameters such as spectral index (κc), density fraction (f), effective rotation frequency (Ωc), ion kinematic viscosity (ηo), and temperature ratio (σ). In the limiting case when the dissipative coefficient D → 0, we have also examined the solitary potential distributions, which are the solutions of the Zakharov Kuznetsov (ZK) equation. It is found that both rarefactive and compressive structures exist for the system under consideration. The transition in the nature of such profiles is due to the enhancement in the density of cold electrons. The importance of present theoretical investigations has been carried out with regard to Saturn's magnetosphere, where two temperature superthermal (Kappa distributed) electron populations have been observed by various satellite missions.