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Electrostatic instabilities in unmagnetized and magnetized multi-component plasma with non-Maxwellian distribution function

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In many physical situations such as space or laboratory plasmas a hot low-density electron populations can be generated superimposed on the bulk cold population, resulting in a particle distribution function consisting of a dense cold part and hot superthermal tail. Space observations show that electron distributions are often observed with flat top at low energies and high energy tails. The appropriate distribution to model such non-Maxwellian features is the generalized (r,q) distribution function which in limiting forms can be reduced to kappa and Maxwellian distribution functions. In this study, Kinetic model is employed to study the electron-acoustic and ion-ion acoustic instabilities in four component plasma with generalized (r,q) distribution function for both magnetized and unmagnetized plasmas. Departure of plasma from Maxwellian distributions significantly alters the growth rates as compared to the Maxwellian plasma. Significant growth observed for highly non-Maxwellian distributions as well as plasmas with higher dense and hot electron population. Existence of weak damping is also established when the distribution contains broadened flat tops at the low energies or tends to be Maxwellian. These results may be applied in both experimental and space physics regimes.