Abstract

Effect of adiabatic trapping as a microscopic phenomenon in an inhomogeneous degenerate plasma is investigated in the presence of a quantizing magnetic field and a modified Hasegawa Mima equation for the ion-acoustic wave is obtained. The linear dispersion relation in the presence of the quantizing magnetic field is investigated. The modified Hasegawa Mima equation is also investigated to obtain bounce frequencies of the trapped particles. The KdV equation is derived for the two dimensional case and finally the Sagdeev potential approach is used to obtain solitary structures.

We have investigated the nonlinear propagating coupled Kinetic Alfven-acoustic waves in a low beta degenerate quantum plasma in the presence of trapped Fermi electrons using the quantum hydrodynamic (QHD) model. By using the two potential theory and the Sagdeev potential approach, we have investigated the formation of solitary structures. We have shown that there are regions of propagation and non-propagation for such solitary structures. We have also highlighted the differences between the classical and quantum mechanically trapped electrons. Interestingly, it has been found that the nature of the nonlinearity for the quantum mechanically trapped electrons is different from its classical counterpart. The results presented here may have applications in white dwarf asteroseismology as well as next generation laser-plasma experiments where low beta plasma condition is met.

We have investigated coupled dust acoustic-kinetic Alfven wave in low beta self-gravitating dusty plasma and have taken adiabatic trapping of electrons and ions into account separately. We have derived the dispersion relations for positive and negative

coupled dust acoustic-kinetic Alfven wave and the limiting cases have also been discussed. By using the two potential theory and the Sagdeev potential approach, we have investigated the formation of solitary structures for coupled dust acoustic-kinetic Alfven waves in the presence of trapped electrons and ions. We have shown that the solitons are formed only for sub Alfvenic mode in both cases. The obtained results have been presented graphically. We have applied our results to the solar corona for negative dust and obtain that the size of the solitary structures of the order of $\xi \approx 1.715 \times 10^5 km$. In the vicinity of Io for positive dust the size of the solitary structures is $\approx 1.715 \times 10^{10} km$