J Phys Chem Biophys 2018, Volume 8
DOI: 10.4172/2161-0398-C1-029

Finite amplitude solitary structures of coupled kinetic Alfvén-acoustic waves in dense plasmas

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In this paper, we have investigated the nonlinear propagating coupled kinetic Alfvén-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 for coupled kinetic Alfvén-acoustic waves in the presence of quantum mechanically trapped electrons. 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 laserplasma experiments where low beta plasma condition is met.

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