

Effect of Fermi pressure and Bohm potential on Langmuir decay instability in strongly coupled degenerate plasma

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Langmuir decay instability (LDI) in strongly coupled degenerate plasma is examined. In this study, the electrons are degenerate and weakly correlated, while non-degenerate ions are strongly correlated. The dynamics of weakly coupled degenerate electron fluid is governed by quantum hydrodynamics. The quantum forces associated with the quantum diffraction effects and the quantum statistical effects act on the degenerate electron fluid. The strong correlation effects of ion are embedded in generalized viscoelastic momentum equation including the viscoelasticity and shear viscosities of ion fluid. It is shown that strong correlation/coupling effects enhance the growth rate of instabilities, while the quantum effects suppress the instabilities. The results are analyzed for understanding LDI in dense white dwarfs which consist of degenerate electrons and strongly coupled ions.

Keywords- Strongly coupled plasma, astrophysical plasmas, parametric instabilities and quantum plasma.

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