Landau Fermi liquid linear and quasilinear theory

Davit Alkhanishvili

Abstract

In recent years a lot of papers were dedicated to studying collective processes in quantum plasma. Such interest was motivated by will to create modern technologies. Such as conductor and semi-conductor nanostructures like nanoparticles, metal clusters, thin metal lattices, nanofibers, quantum X-rays, free electron laser and so on. In compact astrophysical objects we have electron ionic or electron-positronic ionic quantum plasma.

In years 1956- 1958 Landau has created Quantum Fermi Liquid Theory and showed, that if we take into account collective characteristics, we can derive new spectrum, which describes zero sound. Its frequency is greater than ordinary sound wave's frequency. In Landau's theory wasn't considered pure quantum effect like DeBroglie diffraction. We know that at temperatures $1 - 2$ K there exists only two quantum liquid, isotopes He3 and He4.Because of weak interaction between Helium atoms, they remain in liquid state even at extremely low temperatures. Studying these objects in linear and non-linear approximation is current problem. We will study physics of liquid He3 and for describing it, recently derived quantum kinetic equation was used.