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Kinetic Alfenic Waves in Quantum Magnetoplasmas

Deng Zhou and Wenjia Wang
Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, 230031, China
E-mail: dzzhou@ipp.ac.cn

The kinetic Alfenic wave (KAWs) is investigated for quantum magnetoplasmas using the two-fluid model[1,2]. In the model, the temperatures of ions and electrons are comparable and much lower than the electron Fermi temperature, the degeneracy pressure of electrons is much higher than the thermal pressures. Features of the KAWs are determined by the ratio between the Alfenic velocity and the electron Fermi velocity. The dispersion relation of the usual classic KAWs is recovered when the Alfenic velocity is much higher than the electron Fermi velocity as expected. Generally, for uniform plasmas, the dispersion relation of KAWs is the same as the classic KAWs with the ion Lamor radius replaced by ions moving at the electron Fermi temperature. The mode conversion is also discussed for non-uniform quantum plasmas.

[1] F. Haas, “A magnetohydrodynamic model for quantum plasmas”, Phys. Plasmas 12, 062117 (2005).
[2] Q. Haquea and S. Mahmood, “Drift solitons and shocks in inhomogeneous quantum magnetoplasmas”, Phys. Plasmas 15, 034501(2008).