Effects of Ions on the Propagation of Langmuir Oscillations in Cold Quantum Electron-Ion Plasmas

Hyun-Jae Rhee and Young-Dae Jung

Department of Applied Physics, Hanyang University, Ansan, Kyunggi-Do 426-791, South Korea

Reprint requests to Prof. Y.-D. J.; E-mail: ydjung@hanyang.ac.kr

Z. Naturforsch. **63a,** 400 – 404 (2008); received February 11, 2008

The effects of ions on the propagation of Langmuir oscillations are investigated in cold quantum electron-ion plasmas. It is shown that the higher and lower frequency modes of the Langmuir oscillations would propagate in cold quantum plasmas according to the effects of ions. It is also shown that these two propagation modes merge into one single propagation mode if the contribution of ions is neglected. It is found that the quantum effect enhances the phase and group velocities of the higher frequency mode of the propagation. In addition, it is shown that the phase velocity of the lower frequency mode is saturated with increasing the quantum wavelength and further that the group velocity of the lower frequency mode has a maximum position in the domains of the wave number and quantum wavelength.

Key words: Effects of Ions; Langmuir Oscillations; Cold Quantum Plasmas.