

Exchange effects in plasmas: Quantum kinetic theory

Gert Brodin, Jens Zamanian (Umea, University, Sweden) Mattias Marklund (Chalmers University, Sweden).

Abstract: Various quantum effects tend to be significant in dense plasmas. Recently there has been numerous papers studying effects due to the Fermi pressure, due to particle dispersive effects and certain effects associated with the electron spin, e.g. the magnetic dipole force and the magnetization current. An effect that is somewhat more difficult to model is the exchange effects. Here we present a quantum kinetic approach to exchange effects. The general theory is illustrated with simple examples regarding ion-acoustic waves and Langmuir waves. The results are compared with results based on density functional theory, and specifically the local density approximation. The implication of our results are discussed.