

Quantum Mechanical Approach to Complex Plasmas

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Plasma physics has grown its maturity and its applications have been developed into laboratory experiments, industries, planetary space and astrophysics. Most applications remained in a domain of classical physics. Recent advances in fundamental plasma physics suggest the importance of quantum aspects in plasma physics. On the other hand complex plasmas, where dust particles and plasma particles interact each other and show collective behavior, have attracted much attention in plasma community in general. In this lecture quantum mechanical approach to plasma physics is introduced and some applications to complex plasmas are suggested.

1. Quantum Mechanical Approach to Plasma Physics
 - 1.1 Quantization of Electromagnetic Fields
 - 1.2 Quantization of Particles
 - 1.3 Landau Damping

2. Quantum Mechanical Approach to Complex Plasma Physics
 - 2.1 Complex Plasma
 - 2.2 Dust Particulate-Phonon Interaction
 - 2.3 Wake potential
 - 2.4 Casimir Force
 - 2.5 Hydrodynamic Equation for a Collection of Dust Particulates