CAMT Seminar

“Molecular dynamics simulations of strongly coupled plasmas”

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Center for Atomic and Molecular Technologies (CAMT)
(A12 棟 1 階会議室)

Abstract:
Strongly coupled plasmas (SCPs) — in which the average potential energy per particle (originating from their unscreened or screened Coulomb interaction) dominates over the average kinetic energy — appear in a number of physical systems: dusty plasmas, condensed matter systems such as molten salts and liquid metals, electrons trapped on the surface of liquid helium, astrophysical systems, such as the ion liquids in white dwarf interiors, neutron star crusts, supernova cores and giant planetary interiors, as well as degenerate electron or hole liquids in two-dimensional or layered semiconductor nanostructures. Additional experimental systems of high current interest, where SCPs can be formed and studied, include ultracold neutral plasmas and nanoplasmas generated by high-intensity laser sources, e.g. free electron lasers. The talk will review the basics of numerical modeling of classical strongly coupled plasmas, with emphasis on equilibrium and non-equilibrium molecular dynamics (MD) methods. MD simulations make it possible to trace the phase space trajectories of individual particles thereby providing information about the time-evolution of the systems investigated. From the phase-space coordinates of the particles it is possible to derive static, thermodynamic, as well as transport properties of the systems, and to obtain information about the collective excitations. The examples will mostly be given for systems that can be described within the framework of the one-component plasma (OCP) model, in which only one of the components of the plasma is considered explicitly, while the presence and effects of other types of species are accounted for by the interparticle potential.

(Host: Satoshi Hamaguchi Ext：7913)