

2nd TPI Seminar

Date: 13:30 ~ 16:00 Thursday 10 December

Location: Conference room #5 Laboratory building No. 1

Speaker: Dr. Kazuhiro Yabana
(University of Tsukuba)

Title: Time-dependent density functional theory for Extremely Nonlinear Optics

Abstract: At the frontier of optical sciences, studies on interactions of strong laser pulse with matter have been rapidly developing. There is a critical laser intensity above which the laser pulse induces an irreversible damage on a solid. Around the critical intensity, extremely nonlinear interactions of light electric field and electrons bring a number of intriguing phenomena. I would like to talk on theoretical and computational approach to describe such extremely nonlinear light-matter interactions based on time-dependent density functional theory. Conventionally, there are two theoretical approaches for the light-matter interactions: propagation of light pulse in a medium is described by macroscopic electromagnetism, while electron dynamics induced by light electric field is described by microscopic quantum mechanics. Two descriptions are linked by susceptibilities such as dielectric function. In fact, reliable quantum calculations of the susceptibilities have been considered an important goal of condensed matter theory. However, in extremely nonlinear light-matter interactions, such separation of macroscopic electromagnetism and quantum theory is no more useful. I propose a coupled multiscale theory solving Maxwell equations for laser electromagnetic fields and time-dependent Kohn-Sham equation for electrons simultaneously.

Seminar slides can be found (after the seminar) at
http://silver.j-parc.jp/hadron/hadron_seminar/index.html

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