Max-Planck-Institut für Struktur und Dynamik der Materie



Max Planck Institute for the Structure and Dynamics of Matter

December 10th - 11.00 am MPSD Seminar, Room III - (EG.080 - Bldg. 99)

Shunsuke A. Sato

Department of Physics, Graduate School of Pure and Applied Sciences, University of Tsukuba, Japan.

Real-time electron dynamics calculations for nonlinear light-matter interactions

We have been developing a theoretical framework to describe electron dynamics in crystalline solids. In our method, we treat the electron dynamics based on the time-dependent density functional theory (TDDFT). Our method can be applicable to two kinds of problems. One is the electron dynamics in crystalline solids under given electric fields. The other is the propagation of electromagnetic fields including the feedback from the nonlinear electron dynamics induced by the fields. As the former application, we investigate optical properties of laser-excited solids, mimicking experimental pump-probe technique by the TDDFT. As the latter application, we investigate initial-process of non-thermal laser-processing, combining the Maxwell's equation and the TDDFT. By calculating distribution of transferred energy from a laser pulse to a solid, we evaluate the laser damage threshold and the ablation depth. We found that the calculated threshold and depth show nice agreement with results of recent experiments.

Host: Angel Rubio

