

FDITE106 Selected topics in femto- and attosecond pulse phenomena

Aims: To deepen the understanding of the students via advanced numerical modelling in the field of ultrashort light pulses

Content (including lab trainings, projects, industry visits, etc.):

Introduction to short light pulses. Spectral and temporal description. Chirp and GDD of ultrashort pulses.

Gaussian beam propagation (monochromatic beams, ultrashort pulses); truncated Gaussian beams.

Modelling the high-order harmonic generation process: a) classical model, b) Lewenstein model, c) saddle point approximation

Harmonic- and attochirp in HHG.

A short introduction to nonlinear optics. Phase matching in 2nd harmonic generation.

Macroscopic aspects of HHG (phase matching, absorption).

Compression of ultrashort pulses

Non-perturbative methods for time-dependent quantum systems

Theory and numerical modelling of strong-field ionization

High-harmonic generation in solids

Basics and principles of Density-functional theory (DFT) and Time-dependent density-functional theory (TDDFT) with applications in attophysics