LABORATOIRE INTERACTIONS, DYNAMIQUES et LASERS
EMR9000 CEA, CNRS, Université Paris-Saclay

SEMINAIRE LIDYL

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le jeudi 12 mai 2022 à 11h00
Orme des Merisiers, Bât.701, Pièce 17 (Salle de séminaires)

Attosecond and relativistic laser-plasma physics driven by 15 - 100 TW quasi-single-cycle laser pulses

The interaction of intense laser pulses having 1-2 optical cycle duration with matter can provide the shortest light and electron pulses in the attosecond time domain. These attosecond pulses offer the best temporal resolution to investigate electron dynamics in matter, which is the main goal of the Relativistic Attosecond Physics Laboratory in Umeå, Sweden. An overview of the corresponding activities will be presented.
Behind the experiments and attosecond secondary sources, there is a unique light source, an optical parametric synthesizer, called the Light Wave Synthesizer (LWS). It is recently further developed to 100 TW peak power with sub-5 fs duration, which corresponds to less than two optical cycles. LWS-100 has a carrier-envelope phase stable front end, which makes the waveform of the system stable from shot to shot.
One of the main applications of LWS is the generation of intense attosecond pulses around 100 eV in Neon gas. The generation setup is upscaled to support about 100 times more laser energy than traditional kHz lasers can provide. This attosecond source with 40 nJ XUV energy above 70 eV will be introduced. It is designed for applications in nonlinear attosecond spectroscopy, especially attosecond pump - attosecond probe experiments. Another application is relativistic nanophotonics. In these experiments LWS pulses are tight focused (f#1) on nanotips to generate relativistic electron pulses with peak intensities of 10^{20} W/cm^2. The basic properties of these electrons such as charge, angular distribution and spectrum are investigated. Detailed simulations indicate a complex two-step interaction including vacuum laser acceleration and attosecond electron bunch duration.

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