



INSTITUT RAYONNEMENT MATIÈRE DE SACLAY  
Laboratoire Interactions, Dynamique et Lasers



## Attosecond photoionization- and high harmonic- spectroscopies

PhD project at CEA-Saclay, France  
in the framework of the European Research Network MEDEA

The interaction of strong laser fields with atomic and molecular gases leads to the emission of exceptionally short bursts of XUV light of attosecond ( $10^{-18}$  s) duration through the process of high-order harmonic generation. This emission is a coherent process that encodes important information about the structure and dynamics of the radiating atomic or molecular system. Accessing such transient information would help understanding, e.g., the ultrafast charge migration following molecular strong-field ionization. Moreover, the broadband attosecond pulses may be used to ionize molecular targets, allowing the measurement of attosecond ionization delays or the study of the ensuing ultrafast charge migration in a variety of bio-molecules.

***The objective of this PhD project will be to develop both high-harmonic and photoionization spectroscopies and to apply them to the study of various processes, from photoionization delays to the observation and control of ultrafast charge migration in molecules.***

A large part of this work will be performed in collaboration with other members of the **MEDEA European Research Network** through joint experiments in the different associated European laboratories (Milano, Lund, Aarhus) and companies (Amplitude Technologies), as well as with other partner laboratories (London, Columbus-Ohio). The PhD student will join the Attophysics Group, composed of 9 permanent senior researchers and ~10 doctorates and postdocs. Saclay provides an excellent scientific environment: it has a long tradition and expertise in intense laser-matter interactions, and especially, in high harmonic and attosecond pulse generation, both in theory and experiments [1-6]. The Saclay Laser-matter Interaction Center is a LASERLAB European Facility and includes the brand new state-of-the-art ATTOLAB facility. The geographical location (Paris'suburb) close to Orsay University, École Polytechnique, LOA, Institut d'Optique, SOLEIL synchrotron, allows frequent and fruitful exchanges.

***Candidates should send a CV, letter of interest and address of two references to Dr. Pascal Salières (pascal.salieres@cea.fr).*** A background in ultrafast optics, nonlinear optics, atomic and molecular physics is required.

[http://iramis.cea.fr/LIDyL/en/THESES-EDOM/CEA-LIDyL\\_PSalieres\\_EDOM\\_2015\\_EN.pdf](http://iramis.cea.fr/LIDyL/en/THESES-EDOM/CEA-LIDyL_PSalieres_EDOM_2015_EN.pdf)

***The fully funded 3-year PhD grant*** will be determined according to European rules, and will include, in addition to the salary, a monthly mobility allowance and full social security coverage. MEDEA offers advanced training opportunities, supervision and mentorship by internationally renowned experts.

- [1] P.-M. Paul *et al.*, Science **292**, 1689 (2001)
- [2] P. Salières *et al.*, Science **292**, 902 (2001)
- [3] Y. Mairesse *et al.*, Science **302**, 1540 (2003)
- [4] W. Boutu *et al.*, Nature Physics **4**, 545 (2008)
- [5] S. Haessler *et al.*, Nature Physics **6**, 200 (2010)
- [6] P. Salières *et al.*, Reports on Progress in Physics **75**, 062401 (2012)