CEA PARIS-SACLAY UNIVERSITY FRANCE

- **Address**

Orme des Merisiers, 91191 Gif-sur-Yvette

France

- **Scientists in charge**

Pascal Salières (CEA Paris-Saclay)

pascal.salieres@cea.fr

Charles Bourassin-Bouchet (Paris-Saclay University)

charles.bourassin-bouchet@institutoptique.fr

Useful Links

https://quatto.eu/

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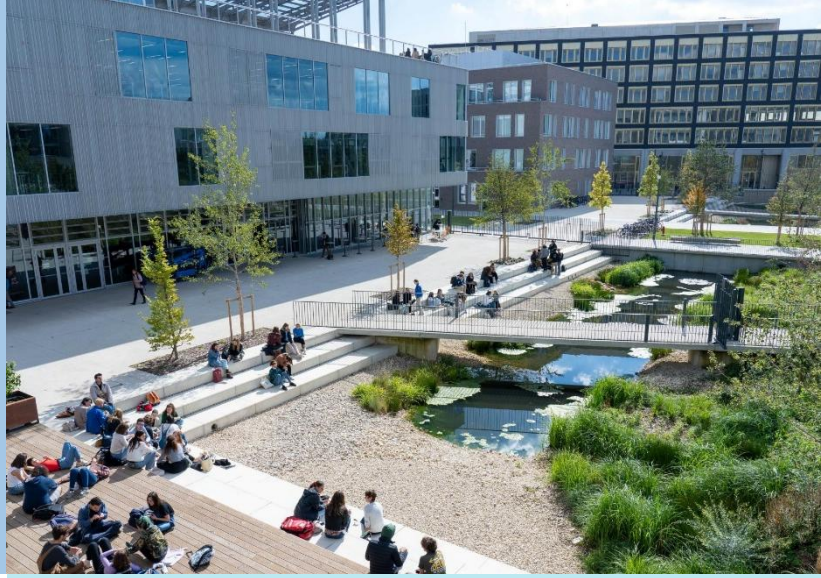
Home Institutions



CEA, the French Atomic and Alternative Energy Commission, is a public government-funded research organization established in 1945. CEA is a key player in research, development and innovation in Europe, covering areas such as low carbon energies (nuclear and renewable energies), technological research for industry, fundamental research in the physical sciences and life sciences. **CEA Paris-Saclay**, the largest research center of CEA, is a partner and participates in the governance of Paris-Saclay University.

The **Paris-Saclay University** is ranked 1st university in France and continental Europe, and 13th in the world by the ARWU Shanghai ranking. With its 50 000 students, 8 100 researchers and professors, and 220 laboratories, it represents 13% of the French research potential. The Saclay plateau is the largest concentrations of public scientific institutions, academic bodies as well as private company labs in France. Among the 500 experimental platforms are large scale facilities featuring XUV and X-ray sources such as SOLEIL synchrotron, APOLLON and ATTOLab laser laboratories.

Useful Links

https://www.cea.fr/english

Université Paris-Saclay

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Group Leader (CEA)

Pascal Salières

- **Graduation:** Engineering degree in Physics and Chemistry from ESPCI-Paris graduate school (1991).
- **PhD**: PhD in Physics from Sorbonne University on the coherence properties of high-harmonic generation (1995).
- **Current Position**: Research Director at CEA, Head of the ATTOPhysics Group at the Laser Interactions and Dynamics Laboratory (LIDYL).
- I performed my PhD studies at CEA Paris-Saclay under the supervision of Anne L'Huillier on the newly-discovered process of high-harmonic generation (HHG). In 1993, I spent 8 months at the Lawrence Livermore National Laboratory (USA) where we made the first attempt to use this XUV source in atomic spectroscopy. In 1995, I was appointed by CEA on a full researcher position to continue this promising research, together with Bertrand Carré and Maciej Lewenstein. We developed advanced phase spectroscopy techniques, based on XUV-photon and electron interferometry, for the characterization and application of harmonic and attosecond pulses. In 2003, the discovery of the atto-chirp with Pierre Agostini and PhD student Yann Mairesse, started a very fruitful series of experiments in attosecond spectroscopy. In 2016, I became Head of the ATTOPhysics Group, and then coordinator of the ATTOLab platform. My current research interests are on attosecond electronic and nuclear dynamics studied by high harmonic spectroscopy and attosecond photo-ionization spectroscopy. From 2025 on, I coordinate a national 'high-risk' research program on attosecond dynamics of entanglement and decoherence in photoemission.

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Useful Links

https://iramis.cea.fr/en/lidyl/atto/

Group Leader (Paris-Saclay University)

Charles Bourassin-Bouchet

- **Graduation:** Engineering degree in Optics and Physics from Institut d'Optique, France (2008).
- **PhD**: PhD in physics from Université Paris-Sud XI (2011) on the development of optical components for the transport, compression and focusing of attosecond pulses.
- **Current Position**: Assistant Professor at Institut d'Optique, Université Paris-Saclay, France.
- After obtaining my PhD from Université Paris-Sud XI (2011), I worked as a postdoc at the University of Oxford, UK, (2011-2013) where I specialized on the temporal characterization of ultrashort pulses. I then joined the SOLEIL synchrotron, France, (2013-2015) to work on free-electron laser science. I continued my carrier at Université Paris-Saclay where I was recruited as an assistant-professor in 2016. My current activities consist in developing conceptual approaches to measure and study the quantum state of the photoelectron released during attosecond photoionization. I focus on solving inverse problems related to the quantum state tomography of photoelecton wavepackets using laser-dressed photoionization. I also study entanglement and decoherence dynamics following ionization. Being at the interface between experimentalists and theorists, I also help identify and prepare relevant experiments.

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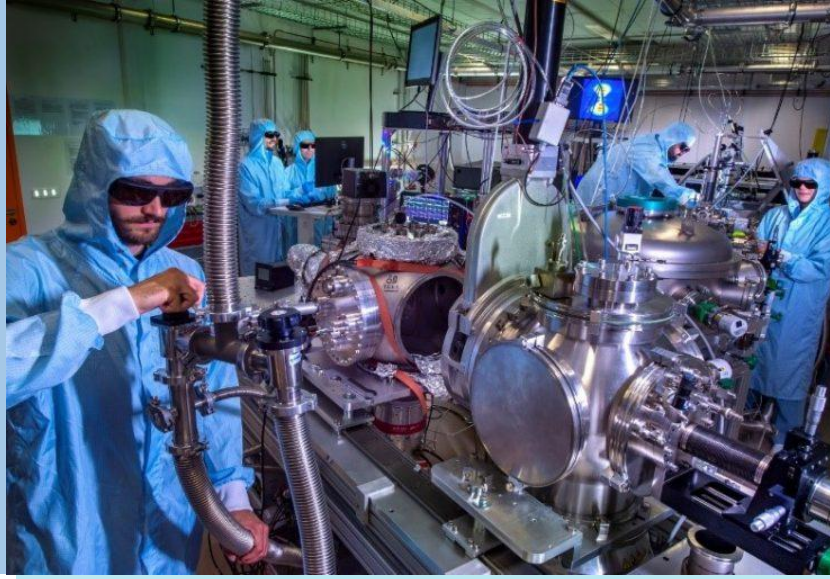
Research Training Modules



Attosecond electron interferometry

Attosecond electron interferometry allows us to probe the coherence of ultrashort electron wavepackets (EWP) photoemitted when attosecond light pulses interact with matter. It provides rich information both on the ionizing light (attosecond metrology) and on the dynamics occurring in the target (attosecond photoionization spectroscopy), such as ionization delays. A standard implementation using attosecond pulse trains is the RABBIT (reconstruction of attosecond beatings by interference of two-photon transitions). We perform RABBIT in the valence and core shells of atoms and molecules, e.g., to determine the influence of the chemical environment on the ionization delays/dynamics. A less standard implementation is the Mixed-FROG that allows performing a quantum tomography of the EWP to recover its density matrix over a broad spectral range, compatible with attosecond resolution. Both techniques require delicate IR/XUV interferometers, highly-resolving electron spectrometers and specific acquisition procedures.

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Scientific courses at Paris-Saclay

The QLMN Master program in Paris-Saclay offers participants to consolidate their knowledge in advanced theoretical and experimental physics in the fields of Quantum, Light, Materials and Nano Sciences.

- Laser-matter interaction
- Advanced atomic and molecular physics
- Strong-field physics and attosecond spectroscopy
- Theoretical quantum optics
- Nanophotonics
- Physics of quantum information
- Quantum technologies

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https://www.master-qlmn.universite-paris-saclay.fr

Transferable skills modules

The Graduate School offers a number of courses and workshops in French and English to provide doctoral candidates transdisciplinary further qualifications. The courses teach core competencies and transferable skills in various areas:

- Management & Innovation
- Communication & Presentation
- Orientation & Career Planning
- Teaching Qualification
- Language Courses
- Ethics & Discrimination prevention

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Life in Paris-Saclay

The so-called “Plateau de Saclay” is a blend of two worlds. The first one is a place where knowledge is shared, a forward-thinking and cutting-edge urban area. The second is a haven of greenery at the entrance to Chevreuse Valley, a great place for walking. Paris-Saclay is a wonderful combination of the town and the countryside, all this within a 30’ train connection to downtown Paris. The Saclay area is a pleasant one to work and to live in. The young researchers may choose between the innumerable resources of Paris or the countryside surroundings of the labs depending on their tastes.

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Useful Links

https://www.destination-paris-saclay.com/en/