
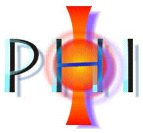



# Call for two postdoctoral positions
## *in ultrahigh-intensity laser-matter interaction at CEA, France*

## Project:
**Studying Optics at Ultrahigh Laser Intensity in Plasmas**,
a project funded by a starting grant of the **European Research Council**

**Summary of the project:**
The goal of this project is to develop "plasma optics", *i.e.* to use plasmas in order to modify and manipulate ultrashort and intense laser pulses. We will study the effect of light on the plasma, and the resulting back reaction of the plasma on light, in a regime where these two entities are strongly and non-linearly coupled. From a fundamental point of view, the coherent light emission from the plasma induced by this interaction will provide unique information on its dynamics in the strong laser field. This will contribute to a better understanding of high-intensity laser-plasma interaction, in particular in the relativistic interaction regime. Besides, developing "plasma optics" is a potentially ground-breaking approach to obtain new light sources of shorter durations or higher intensities than previously available, in new wavelength ranges.

**Position #1: "Attosecond pulse generation on plasma mirrors"**
The successful candidate will be involved in the experimental study of high-order harmonic generation on plasma mirrors, which is a promising route toward a second generation of attosecond light sources [1-3], in particular in the relativistic interaction regime. Experiments will mostly aim at measuring the properties of the generated harmonics, in particular the spatial and temporal properties. A major goal is to accurately measure the temporal structure of the electromagnetic field resulting from the interaction, with an attosecond resolution. This will involve using state-of-the-art attosecond measurement techniques, as well as developing new and original ones.

[1] C.Thaury *et al.* Nature. Phys. **3**, 424-429 (2007)
[2] Y.Nomura, et al., Nature. Phys **5**, 124-128 (2009)
[3] F.Quéré, Nature Phys. **5**, 93-94 (2009)

**Position #2: Ultrahigh-Intensity non-linear propagation in underdense plasmas**
The successful candidate will be involved in the experimental study of the propagation of ultrashort and ultraintense (up to the relativistic regime) laser pulses in underdense plasmas. Although this propagation plays a key role in laser wake-field accelerators, it has not yet been studied in detail experimentally [4,5]. Experiments will mostly aim at accurately measuring the properties of the ultrashort laser pulse after the propagation. One important goal is to measure the temporal structure of the electromagnetic field resulting from the interaction, with spatial resolution. To this end, an advanced optical device based on a state-of-the-art ultrashort pulse measurements technique will be built.

[4] J. Faure *et al*, Nature **431**, 541 (2004); C. Geddes *et al*, Nature **431**, 538 (2004) ; S. Mangles *et al*, Nature **431**, 535 (2004).
[5] WP Leemans *et al*, Nature Phys. **2**, 696 (2006)

**Additional information:**
The successful applicants will be employed by CEA, for up to 4 years. They will work in the Physics at High Intensity group in CEA-Saclay (20 km SW of Paris), under the supervision of Fabien Quéré. Experiments will mostly be performed on a state-of-the-art high-contrast 100 TW-25 fs laser, in the Saclay Laser-Matter Interaction Center (SLIC). Depending on their interests, the successful applicants will also have the opportunity to perform 2D or 3D Particle-IN-Cell simulations on massively-parallel computers, using different codes available in the group.

**Required qualification:**
The candidates should have a PhD related to optics or laser-matter interaction, and hands-on experience in experimental physics, either in the field of laser-matter interaction or ultrafast optics. Knowledge in the metrology of ultrashort laser pulses is a strong asset.

Interested applicants should e-mail a CV, publication list and the contact information for at least two references, to fabien.quere@cea.fr. For additional information, contact:

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