3-year funded PhD thesis – starting 1st September 2019

Measuring and manipulating chiral light-matter interaction on the attosecond timescale

Location: CELIA, Université de Bordeaux, France

Project:

Chiral molecules exist as two mirror forms, so-called enantiomers, which have essentially the same physical and chemical properties and can only be distinguished via their interaction with a chiral system, such as circularly polarized light. Many biological processes are chiral-sensitive and unraveling the dynamical aspects of chirality is of prime importance for chemistry, biology and pharmacology.

Studying the ultrafast electron dynamics of chiral processes requires characterization techniques at the attosecond timescale. The project aims at developing new approaches to measure and manipulate chiral light-matter interaction using the three pillars of attosecond science: high-order harmonic generation, photoionization, and transient absorption.

The project builds upon the long and fruitful history of collaboration on attosecond spectroscopy between Weizmann Institute (Nirit Dudovich's group, Rehovot, Israel) and CELIA. The PhD student will be based at CELIA, Université de Bordeaux, where she/he will integrate a team of 2 senior experimentalists, 2 senior theoreticians, and 3 PhD students. She/he will carry most experiments at CELIA, using the Aurore (Ti:Sa, 1kHz, 25 fs) and the BlastBeat (Yb:Fibre, 166kHz-2MHz, 130 fs) laser systems, dedicated XUV beamlines and detectors (Velocity Map Imaging, COLTRIMS). She/he will be in charge of developing new approaches to probe attosecond chiral dynamics, in the continuity of the works performed at CELIA in the past few years: chiral high-order harmonic generation [1], strong field and attosecond-resolved photoelectron circular dichroism [2,3], photoexcitation circular dichroism [4], and photoelectron elliptical dichroism [5]. In addition, she/he will closely collaborate with Weizmann Institute and will perform complementary experiments there using the recently developed phase-resolved absorption circular dichroism setup [6].

Profile:

We are seeking highly motivated candidates, with good skills in experimental physics, data analysis, multi-task organization, and collaborative work. An experience in strong-field physics, ultrafast dynamics, vacuum technology, photoelectron spectroscopy or chirality will be highly beneficial. Fluent English required.

Conditions:

The PhD duration is strictly 3 years, starting 1st September 2019. The monthly salary is 1640€ net. CELIA is located in Talence, 5 km away from downtown Bordeaux, 15 minutes by tram or by bike.

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Interested candidates should apply via the following link **before June 17th 2019**: http://bit.ly/2FFRi6c

More information on the group activities can be found at harmodyn.celia.u-bordeaux.fr

References:

[1] *Probing molecular chirality on a sub-femtosecond timescale*, R. Cireasa *et al.*, Nature Physics **11**, 654 (2015)
[2] *Universality of photoelectron circular dichroism in the photoionization of chiral molecules,* S. Beaulieu *et al.*, New Journal of Physics **18**, 102002 (2016)
[3] *Attosecond-resolved photoionization of chiral molecules,* S. Beaulieu *et al.*, Science **358**, 1288 (2017)
[4] *Photoexcitation Circular Dichroism in Chiral Molecules*, S. Beaulieu *et al.*, Nature Physics, **14**, 484 (2018)
[5] *Real-time determination of enantiomeric and isomeric content using photoelectron elliptical dichroism,* A. Comby *et al.*, Nature Communications **9**, 5212 (2018)
[6] *Interferometric attosecond lock-in measurement of extreme ultraviolet circular dichroism,* D. Azoury *et al.,* Nature Photonics, **13**, 198 (2019)