**Opportunities for exploring ps-dynamics in the VUV - XUV range on gas phase molecules including chiral systems**

Laurent Nahon

*Synchrotron SOLEIL*

*L’orme des merisiers, BP 48 St Aubin, 91192 Gif sur Yvette Cedex, France*

Email: Laurent.nahon@synchrotron-soleil.fr

We will discuss some opportunities regarding dynamical studies on solvent- and substrate-free gas phase molecules, offered by the possible combination of ps synchrotron radiation (SR) pulses (VUV-soft X-rays) with synchronized laser pulses at MHz repetition rates.

Starting form 20th century’s pioneering laser+SR pump/probe experiments and underlying their limits, we will mainly explore two alleys of possible research for such a two-photon scheme: (i) when the initially prepared intermediate state has a short lifetime, requiring a temporal confinement of the two pulses; (ii) when time-domain molecular dynamics is to be explored.

This latter topic will be mainly exemplified by the case of chiral molecules whose photoionization by CPL involves, on top of the cross section  and the usual anisotropy parameter , a 3rd observable, the dichroic parameter b1 quantifying the PECD (PhotoElectron Circular Dichroism), an intense chiroptical effect observed by a forward/backward asymmetry in the photoelectron angular distribution. PECD appears to be a very sensitive probe of static (isomers, conformers, clustering) and dynamical (vibration) molecular structures [1], and is therefore a powerful observable to template chiral molecular dynamics, as recently demonstrated by fs-laser UV REMPI experiment [2]. Possible extensions to shorter wavelengths (VUV/soft X-rays) and longer timescales (ps) will be briefly discussed.

**References**

[1] for a recent review see R. Hadidi, D. Bozanic, G. Garcia and L. Nahon 2018, *Advances in Physics:* X **3**, 1477530.

[2] A. Comby et al. 2016, *J. Phys. Chem. Lett*. **7,** 4514.