LABORATOIRE INTERACTIONS, DYNAMIQUES et LASERS
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SEMINAIRE LIDYL / COLLOQUIUM ISL

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Attention jour exceptionnel

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Orme des Merisiers Bât.701, Pièce 17 (Salle de séminaires)

https://cnrs.zoom.us/j/93622375451?pwd=b0lUR2xWRUpHU1htZVVBV3dONW1vdz09
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Watching atoms and electrons in action with HHG and short wavelength free electron laser sources

The present talk will illustrate the current status of short-wavelength free-electron laser (FEL) experiments, focusing on characteristic properties of different facilities and compare them with laboratory-based HHG source experiments. The advent of hard x-ray FELs, such as SACLA in Japan, opened a route to extract the structure of a single nanoparticle [1] and its change upon the intense laser irradiation, which transforms the nanoparticle into a nanoplasma [2]. The first high repetition rate soft x-ray FEL, the European XFEL, combined with a Reaction Microscope/COLTRIMS, made the long-standing dream to watch atoms in action - initiated by photoexcitation of a molecule - a tangible reality, using the so-called core-level photoelectron diffraction technique for fixed-in-space molecules [3]. Generation of two-color attosecond pulse pairs at the LCLS in the USA finally opened the door to watching charge migration in a molecule, before the nuclear dynamics sets in, with an attosecond transient absorption technique based on the detection of resonant Auger electrons [4]. Generating phase-coherent multi-color pulses at FERMI, on the other hand, provided a novel approach to coherently control the electronic wave-packets [5] and to read out the photoionization phase [6]. One can also directly access the energy dependent photoionization phases, or the photoionization time delays, by using the RABBITT technique with a laboratorybased HHG source, or attosecond pulse trains, which could also be used for studying the attosecond trapping of photoelectrons by the molecular shape resonances [7]. These works were carried out by a wide range of international collaborations.

I acknowledge all the collaborators in the authors list of [1-7] for fruitful collaborations.
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[2] T. Nishiyama et al., PRL 123, 123201 (2019); A. Niozu et al., PRX 11, 031046 (2021).
[3] G. Kastire et al., PRX 10, 021052 (2020).
[4] T. Barillot et al., PRX 11, 031048 (2021).
[5] K. Prince et al., Nature Photonics 10, 176 (2016); D. Iablonskyi et al., PRL 119, 073203 (2017).
[6] M. Di Fraia et al., PRL 123, 213904 (2019); D. You et al., PRX 10, 031070 (2020).
[7] X. Dong et al., PRX 12, 011002 (2022).