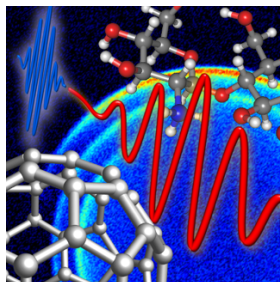


Laboratory : Institute of light and matter (iLM)
Research Team : Structure and multi-scales dynamics of complex molecules ([web](#))
Supervision : Marius Hervé (PhD student), Saikat Nandi (CNRS), Vincent Lorient (UCBL) & Franck Lépine (CNRS)
Contact : franck.lepine@univ-lyon1.fr



For Master 2 student - Year 2018-2019

Attosecond Quantum Dynamics induced by ultrashort XUV pulses in Fullerenes

Modern laser technology allows the generation of ultrashort and intense light pulses (Physics Nobel Prize 2018) which has led to the emerging field of attosecond science. In attosecond physics, electron dynamics can be observed on the atomic length scale which provides new means to study and control matter on the quantum level.

The group “Multiscale dynamics in molecular structure” at iLM has pioneered the use of such pulses to study molecules using pump-probe spectroscopy^{1,2,3}. In molecules, the generation of ultrafast charge wavepackets and its manipulation on a timescale that is shorter than the nuclear motion, opens new opportunities to design molecular properties. On the fundamental point of view, it offers a new way to test many-body quantum theories where counter intuitive charge movement and energy flow through molecular backbone are foreseen⁴.

In this project, the student will use the attosecond beamline developed at iLM to perform time-resolved electron momentum imaging experiments on model polyatomic species such as C₆₀ and other carbon nano-cages, to measure attosecond electron scattering, electronic and vibrational coherences and ultrafast energy transport in fullerenes excited in the plasmon resonance vicinity. This experimental work is developed in close collaborations with theoreticians.

We seek for a highly motivated Master 2 student interested in ultrafast science and in the emerging field of attosecond physics. Feel free to contact us for further information.

Possibility for PhD Thesis: YES

¹ Attosecond molecular dynamics: fact or fiction? F. Lépine et al. Nature Photonics 8, 195–204 (2014)

² Electron localization following attosecond molecular photoionization. Sansone, G. et al. Nature 465, 763–766 (2010)

³ Probing time-dependent molecular dipoles on the attosecond time scale. Neidel, Ch. et al. Phys. Rev. Lett. 111, 033001 (2013)

⁴ Attosecond Molecular dynamics, Lépine and M. Vrakking, Royal Society of chemistry, Book (2018)