Università degli Studi di Trieste

Dipartimento di Fisica

Seminario

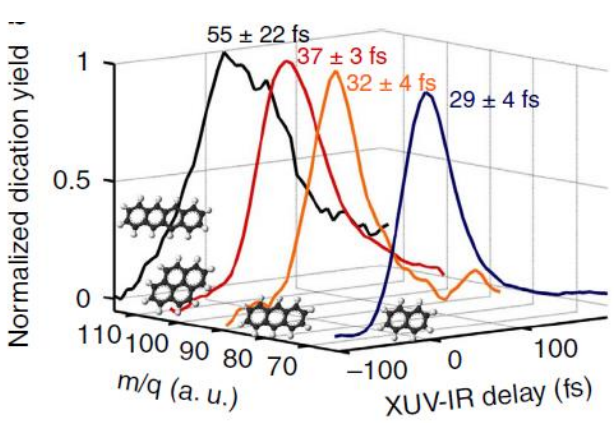
Alexander Marciniak

Institut Lumière Matière, CNRS, University of Lyon

Thursday, November 10, 11:00 AM - Lecture Room B, F building, Dip. di Fisica – via Valerio 2 – Trieste

Electrons and nuclei ultrafast dynamics triggered in super-excited complex molecular systems

Molecules are perfect examples of the complexity of a many-bodies quantum problem since electronic correlation and electrons-nuclei couplings are terms that cannot be analytically solved. Experimentally, specific photoexcitations of these molecules can trigger dynamics that start on the attosecond time scale (1 as = 10^{-18} s) up to the loss of their quantum coherence. Moreover, one mean to enhance multielectronic effects is to use extreme ultraviolet light (XUV) in order to ionize inner-valence electrons of complex polyatomic systems. Thus, the produced cationic states result from higher order photo-excitation processes and their dynamics lead to considerations out of the frame of the Born-Oppenheimer approximation. Recent developments in ultrafast science concerning the XUV ultrashort pulses sources, produced by high harmonic generation (HHG), allow studying these mechanisms from the attosecond time scale up to the femtosecond (1 ps = 10^{-15} s) or the picosecond (1 ps = 10^{-12} s) time scales [1]. Here, I will present an overview of this physics field and show the results of two studies performed on a biomolecule and carbonaceous molecules thanks to a XUV-pump IR-probe spectroscopy setup coupled to a velocity map imaging spectrometer (VMIS) [2]. More specifically, we have examined the role of the ultrafast charge dynamics induced by XUV photo-ionization on fragmentation mechanisms in the caffeine molecule and we have studied, in Polycyclic Aromatic Hydrocarbons (PAHs), the ultrafast non-adiabatic relaxation of highly excited cationic states [3]. The observed processes allow a better understanding of the implication of multielectronic effects and electrons-nuclei couplings in complex polyatomic systems.



[1] Nature Photonics, 8:195, 2014.
[2] J. of Phys. Conf. Series, 635:012006, 2015.
[3] Nat. Commun., 6:7909, 2015.

Organizzazione a cura di: Daniele Fausti (daniele.fausti@elettra.eu), Erik Vesselli

dipartimento di TRIESTE fisica

UNIVERSITÀ DEGLI STUDI DI TRIESTE

INFN Istituto Nazionale di Fisica Nucleare

Everyone interested in the topic is welcome to attend

Informazioni: seminari@ts.infn.it