

Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

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Lieu du stage / internship place: Laboratoire de Chimie Physique-Matière et Rayonnement			

Titre du stage / internship title: **Multi-particle momentum correlations in radiative and non-radiative decay of deep core excited atoms and molecules.**

Résumé / summary

Resonant excitation and direct ionization of deep core levels in the tender x-ray region (1 to 10 keV) leads to the formation of multiply charged ions through complex radiative (x-ray emission) and non-radiative (cascade Auger decay) decay pathways. Radiative and non-radiative pathways are in competition and the whole relaxation process can be a cascade of the different types of processes [1,2]. A variety of physical processes is revealed in the spectra of the different particles (photons, electrons, and ions) produced.

The aim of the present proposal is to investigate momentum correlations in deep core levels photoionization by means of a relatively unexplored coincidence technique, namely photon-photoion coincidences. The basic principle of the proposed experiment is to induce a core-excitation or core-ionization in an atomic system, or in a molecular system, and to detect a photon emitted during the radiative core-hole decay in coincidence with the ions of different charges produced.

Measurements of photon/ion coincidences will be done at SOLEIL on beamline LUCIA, in the 1keV to 8keV energy domain. Our setup, CELIMENE [3], is based on a double time-of-flight spectrometer equipped with delay-line position sensitive detectors for full vector momentum measurements. One detector will be fitted with CsI coated microchannel plates for improved photon detection. The systems we will study are Argon and CH₃Cl. Preparation of the experimental setup and data analysis will be made at LCPMR.

[1] R. Guillemin et al., Phys. Rev. A 84, 063425 (2011).

[2] R. Guillemin et al., Phys. Rev. Lett. 109, 013001 (2012).

[3] C. Bomme et al., J. Phys. B: At. Mol. Opt. Phys. , 45, 194005 (2012).

Toutes les rubriques ci-dessous doivent obligatoirement être remplies

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : Oui

Si oui, financement de thèse envisagé/ financial support for the PhD: Bourse MESR ou CNRS/SOLEIL

Lasers et matière		Lumière, Matière : Mesures Extrêmes	X
Optique de la science à la technologie		Plasmas : de l'espace au laboratoire	

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