Mini-Symposium PALM-LUMAT : Physics at the X-FEL

Mercredi 7 mars 2012

Amphi Lehmann, LAL, bât. 200, Campus d'Orsay, Université Paris-Sud

Entrée libre, sans inscription préalable

9h25 Accueil

9h30 **Strong-field atomic physics in the x-ray regime**

Louis DiMauro

The Ohio State University, Department of Physics, Columbus, OH 43210

The advent of x-rays sources with unprecedented intensity will enable the study of nonlinear physics in the high frequency regime. In 2009, a physicist dream became reality with the commissioning of the world's first x-ray free-electron laser, the LCLS, at SLAC. In contrast to low frequency strong-field physics where valence electrons react to the optical field, at high frequency the atom will be ionized from the inside out. The question remains as to whether the atomic response to x-rays will be adequately described by low-order perturbation theory or necessitate a non-perturbative description which is more commonly used at low-frequency. In this talk, these issues will be raised along with the basics of x-ray free-electron laser operation and initial experiments performed at the LCLS.

10h20 **XFEL-SCIENCE : The French X-ray Free Electron Laser User Community- GDRI**

Jan Lüning

LCPMR, UPMC 11, rue Pierre et Marie Curie, 75005 Paris

The unprecedented properties of X-ray free electron laser (XFEL) sources offer novel experimental capabilities with applications in a wide variety of scientific disciplines. In particular since the advent of LCLS, the first XFEL covering the hard x-ray photon energy range, this has let to such a strong demand that only a small fraction of the proposed experiments can be realized. To help researchers from French laboratories to get involved and to succeed in this competitive environment, the formation of a XFEL user community organization was proposed, which the CNRS has decided to support as a Groupement de Recherche International. Goals, activities and how to get involved in this GDRi will be presented.

10h35 Pause

10h50 **Generation and investigation of hard x-ray free electron laser heated foils**

Patrick Audebert

LULI Ecole polytechnique, CNRS, CEA, UPMC, route de Saclay , 91128 Palaiseau

We report a recent experiment performed on the hard x-ray beamline (X-ray Pump Probe-XPP) at the Stanford Linac Coherent Light Source (LCLS) free electron laser devoted to the study of high-pressure high-energy density (HED) states. This regime of matter, hardly describes by the theoretical models, is poorly known due to the difficulty of achieving these conditions experimentally. The development of free electron laser instruments opens a unique opportunity to generate this regime in laboratory as it allows to efficiently and uniformly heat the matter up to ~ 10 eV in a ultra-short short duration under 100 fs. Such an experiment is of primary importance since this regime is involved in a large panel of research areas ranging from planetology to inertial fusion.

11h30 **Studying ultrafast magnetization dynamics at the nanoscale using EUV and X-rays femtosecond sources**

Boris Vodungbo

LOA ENSTA Chemin de la Hunière 91761 Palaiseau

Ultrafast demagnetization refers to a rapid loss of magnetization (on the order of a few hundreds of femtoseconds) upon heating by a femtosecond pulsed laser. This phenomenon is observed in the ferromagnetic compound of transition metals and has been known for 15 years [1]. Even though a convincing phenomenological model explaining ultrafast demagnetization for elemental ferromagnets has been proposed [2], more experimental data are needed to ascertain its validity and to extend it to more complex systems.
In my presentation, I will report on some of the first results obtained on ultrafast demagnetization at EUV and X-rays FEL (LCLS and FLASH). I will compare these results to those obtained with other sources of ultrashort EUV pulses (e.g. high order harmonics).
[1] E. Beaurepaire et al., Phys. Rev. Lett. 76, 4250 (1996) [2] B. Koopmans et al., Nature Mater., 9, 259 (2010)

12h15 Clôture

Contacts : D. Dowek 01 6915 7672 L. Pruvost 01 6935 2101 C. Jucha 01 6915 5040 P. Audebert 01 6933 5390 J. Lüning 01 4427 6607