Postdoc Position in Nonlinear and Ultrafast X-ray Science

The group for ultrafast- and high-field X-ray science at the **University of Nebraska-Lincoln (UNL)** has an immediate opening for a **postdoctoral researcher** in the areas of development and applications of next-generation ultrafast X-ray sources, nonlinear X-ray science and high-power lasers. Experiments will be mainly conducted at UNL's PetaWatt laser facility and X-ray free-electron laser (XFEL) facilities around the world, including the LCLS at SLAC National Laboratory.

Project Description

Our research is mainly focused on the generation and application of ultrafast and high-field X-ray radiation. The projects are largely concerned with (a) the development and first applications of what might become the next-generation X-ray source and (b) the application of X-ray radiation generated by novel X-ray free-electron lasers.
More specific, in research area (a) we are developing an ultrafast X-ray source that has table-top dimensions[1] rather than the typical kilometer scale of conventional synchrotron facilities. Our novel approach is based on the recently developed scheme of laser-plasma electron acceleration. The generated X-ray pulses of only few-femtosecond duration are perfectly suited for time-resolved four-dimensional atomic imaging experiments. This will allow us to observe the motion of atoms in both, their natural time and length scales and thus the investigation of fundamental non-equilibrium processes in molecules, chemical reactions or solids[2]. The electron accelerator is driven by UNL's Diocles PetaWatt laser, which is in the worldwide unique position to advance this research field by performing key-experiments that have the potential to critically contribute to its success.
For research area (b), we use the unprecedented properties of XFEL radiation to investigate fundamental nonlinear X-ray - matter interactions. Ultrashort coherent XFEL pulses can generate extreme peak intensities in which ordinary rules of light-matter interaction may no longer apply and nonlinear processes start to become important. In recent experiments performed in collaboration with the Stanford PULSE institute we have observed some of the most fundamental nonlinear X-ray optics processes for the first time[3-5]. In one of these experiments we have observed a substantial anomalous red shift in the energy of photons generated by nonlinear two-photon X-ray Compton scattering in beryllium[5]. This completely unexpected result demonstrates that the field of nonlinear X-ray optics is still widely unexplored.
Both of these disciplines are young research fields, where novel creative approaches can lead to breakthrough impacts.

Requirements

We are seeking a highly motivated candidate with a strong experimental background in ultrafast science, X-ray physics, laser physics or high-field physics. Successful candidates should show self-initiative and be able to independently manage and conduct a research project. They should have performed innovative and original research and should have completed a PhD in Physics, Optics, Electrical Engineering, or related fields within the last years.

Research Setting

The research is conducted by a young, energetic group within an already established laboratory setting at one of the few PW laser facilities worldwide.
Lincoln, Nebraska is a mid-size city (population: 300k) with the security of a small town. It is the state capital and the home of UNL, the flagship campus of the University of Nebraska. Lincoln offers a lot of cultural attractions and diversity with a college town atmosphere: liberal, young and educated, with nice architecture, lots of good bars and restaurants. It is a very affordable place to live and has been voted as the happiest US city in a recent Gallup Poll.

Contact

Please contact Prof. Matthias Fuchs via email with the subject line "Re: postdoc position opening" at mfuchs@unl.edu, http://physics.unl.edu/fuchs

[1] M. Fuchs, R. Weingartner, A. Popp, *et.al.* Nat Phys, 5 (2009).
[2] M. Trigo, M. Fuchs, J. Chen, *et.al*. Nat Phys, 9 (2013).
[3] T. E. Glover, D. M. Fritz, M. Cammarata, *et.al* Nature, 488 (2012).
[4] S. Shwartz, M. Fuchs, J. B. Hastings, *et.al.* PRL, 112 (2014).
[5] M. Fuchs, M. Trigo, J. Chen, *et.al.* Nat Phys 11 (2015).