Max Planck Institute for Nuclear Physics
Heidelberg, Germany

Two Ph.D. students and a postdoc – ultra-fast strong-field physics at x-ray lasers

The two Ph.D. projects and the postdoc position are directed towards improving the basic understanding of the combination of strong optical lasers with x-ray lasers.

The established laser schemes fail for the x-ray part of the spectrum. Only the revolutionary idea to use free electrons as the lasing medium has allowed the construction of large-scale freeelectron lasers (FELs). Namely, the Linac Coherent Light Source (LCLS) in Stanford and the Free Electron Laser in Hamburg (FLASH) serve x rays with exciting novel traits. In the ultrashort x rays of unprecedented intensities, atoms and molecules showcase intriguing new behavior. The combination of intense optical laser light with intense x rays [see: Buth *et al.*, Phys. Rev. Lett. 98, 253001 (2007)] leads to fascinating new effects like electromagnetically induced transparency for x rays. Such discoveries spark interest in how other schemes from quantum optics can be realized in the x-ray domain, like for example, lasing without inversion. Further, the intense optical laser light leads to high harmonic generation (HHG) that can be used to produce attosecond pulses. Specifically, the HHG process can be manipulated with the intense x rays from FELs.

Ph.D. candidates for the two positions are expected to carry out analytical and numerical model calculations with a many-body system dynamically driven by laser fields, in the framework of (relativistic) quantum mechanics. From the theoretical side, Christian Buth and Christoph H. Keitel provide support for the project. Candidates should have a master degree or equivalent degree in physics and be highly motivated to work on a challenging theoretical project. A solid background in theoretical physics is desirable. Experience in theoretical atomic, molecular, and optical physics and fluency in English are an advantage.

The research project will be carried out at the **Max Planck Institute for Nuclear Physics**, www.mpi-hd.mpg.de, Postfach 103980, 69029 Heidelberg, Germany.

Please send your application **(ref. # 03/2010)**, including CV, list of publications/scientific contributions and M.Sc. certificate by email to Christian Buth (cbuth@slac.stanford.edu).

The Max Planck Society wishes to increase the participation of women in its research activities. Therefore applications by women are particularly welcome. The Max Planck Society is committed to employing more handicapped individuals and especially encourages them to apply.