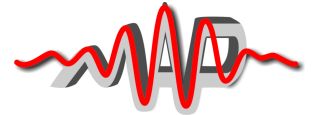




PRESS-RELEASE  
**Max Planck Institute of Quantum Optics**  
and  
**Munich Centre for Advanced Photonics**



Garching, den 06.11.2009

### 4D Films from the Microcosm

*Motion in the microcosm is to be recorded by a team at the Laboratory of Attosecond physics of LMU and MPQ by means of ultrashort flashes consisting of individual electrons. The project is being funded with 2.5 million euro "ERC Advanced Investigator Grant" awarded by the European Union to Prof. Ferenc Krausz.*



**Electrons, atoms and molecules play the leading roles in the films to be produced by a team of laser physicists around Prof. Ferenc Krausz and Dr. Peter Baum in the project towards "4D Imaging of fundamental Processes on the Atomic and Sub-atomic Scales". As the particles in the microcosm move within attoseconds and femtoseconds, scientists have to be just as fast with their recording techniques. A femtosecond is a millionth of a billionth of a second, an attosecond being a thousand times shorter.**

About 24 sequences per second are sufficient to run a film viewed by the human eye. But continuous recording of the ultrafast motion of atoms and their electrons requires a billion times as many sequences per second. Such films from the microcosm are now to be produced by a team of laser physicists headed by Dr. Peter Baum from the Ludwig Maximilians Universität of Munich and Max Planck Institut für Quantenoptik at Garching. This is done with particle flashes consisting of individual electrons and produced by means of laser light. These electrons flashes last only femtoseconds to attoseconds. The physicists fire the electrons of these in turn deflect the particles, which are then detected. This provides the physicists with so-called diffraction images of the samples, about 100 million billion pictures per second. These record the motion of atoms and their inner life, thus giving an insight into the course of chemical and physical reactions in nature.

For the first time technology is to convey not only a spatial notion of the processes within atoms and solids, but also of temporal course (4<sup>th</sup> dimension) of events in the microcosm.

**Thorsten Naeser**

Contact:

**Dr. Peter Baum**

Max-Planck-Institut für Quantenoptik, und Ludwig-Maximilians-Universität München  
Am Coulombwall 1, 85748 Garching, Germany  
Tel: +49 89 289 14102  
E-Mail: peter.baum@lmu.de  
[www.ultrafast-electron-imaging.de](http://www.ultrafast-electron-imaging.de)

**Prof. Ferenc Krausz**

Max-Planck-Institut für Quantenoptik, Garching  
Tel: +49 89 32905-612  
Fax: +49 89 32905-649  
E-Mail: [ferenc.krausz@mpq.mpg.de](mailto:ferenc.krausz@mpq.mpg.de)  
<http://www.attoworld.de>

Max-Planck-Institut für Quantenoptik  
Presse- und Öffentlichkeitsarbeit  
Dr. Olivia Meyer-Streng  
Phone: +49-8932 905-213  
E-mail: [olivia.meyer-streng@mpq.mpg.de](mailto:olivia.meyer-streng@mpq.mpg.de)  
Hans-Kopfermann-Str. 1, D-85748 Garching

Munich-Centre for Advanced Photonics  
Public Outreach  
Christine Kortenbruck  
Phone: 089-289-14096  
E-mail: [christine.kortenbruck@munich-photonics.de](mailto:christine.kortenbruck@munich-photonics.de)  
Am Coulombwall 1, 85748 Garching