PRESS-RELEASE

Max-Planck-Institute of Quantum Optics

and

Munich-Centre for Advanced Photonics

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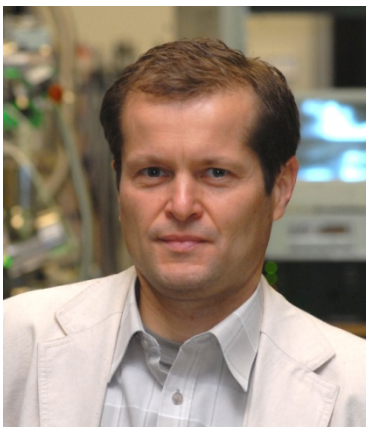
Otto Hahn Prize for Ferenc Krausz

The city of Frankfurt-am-Main, the German Chemical Society and the German Physical Science Society have awarded the Otto Hahn Prize 2013 to Prof. Ferenc Krausz



Ferenc Krausz, a Director at the Max Planck Institute for Quantum Optics in Garching and Head of the Institute of Experimental Physics at LMU Munich, has been awarded the Otto Hahn Prize 2013, worth 50,000 euros. The biennial award is sponsored by the City of Frankfurt-am-Main, the German Chemical Society (*Gesellschaft Deutscher Chemiker*, GDCh) and the German Physical Science Society (*Deutsche Physikalische Gesellschaft*, DPG) and is presented alternately to researchers in the fields of physics and chemistry. The Hungarian-born Krausz receives the accolade for his ground-breaking contributions to attosecond physics – advances that make it possible to monitor the dynamics of electrons. The award will be presented at a ceremony in the Paulskirche in Frankfurt on November 20th.

In 2001, Ferenc Krausz and his collaborators were the first research group to succeed in generating and timing pulses of extreme ultraviolet light lasting for a few hundred attoseconds. An attosecond (1 as) is a billionth of a billionth of a second (10^{-18} sec). This breakthrough marked the birth of the field of attosecond physics, and represents a milestone in experimental physics. The attosecond flashes provide the ultrashort exposure times that make it possible to take snapshots of the ultrafast dynamics of electrons in molecules, allowing one to “photograph” their instantaneous motions. More recently Krausz and his team have been able to “film” the motions of electrons in atoms and molecules, in real time.

In principle, attosecond light pulses could be used to control electric currents directly, which would greatly enhance the performance of electronic devices. Here too, Krausz and his group have made seminal discoveries. In 2012 they demonstrated for the first time that the electrical properties of materials, which are the product of the collective behavior of their electrons, can be modulated at optical frequencies. The electromagnetic field associated with visible light oscillates at a few million billion cycles per second (Hz). This method of manipulating electric signals with instantaneous light fields opens up the prospect of greatly reducing switching times, and extending signal processing rates into the petahertz (10^{15} Hz) range. This is about 10,000 times faster than that attainable with the best semiconductor-based microchips, which exhibit switching rates of 100 billion Hz.

The groundwork for these pioneering achievements was carried out by Krausz and his colleagues in the 1990s, during which they extended the boundaries of laser technology close to its ultimate limits. They now routinely generate pulses in which the bulk of the energy is packed into a period equal to that of a single oscillation of the electric field, or just over 2 femtoseconds (1 fs is a millionth of a billionth of a second),. These are the pulses used to generate the even shorter attosecond flashes.

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Born in 1962, Ferenc Krausz studied in Budapest and Vienna. In 2003 he became a Director of the Max Planck Institute for Quantum Optics in Garching, and has held the Chair of Experimental Physics at LMU Munich since 2004. Krausz is one of the two Speakers for the Munich-Centre for Advanced Photonics, an Excellence Cluster that he helped to initiate.

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