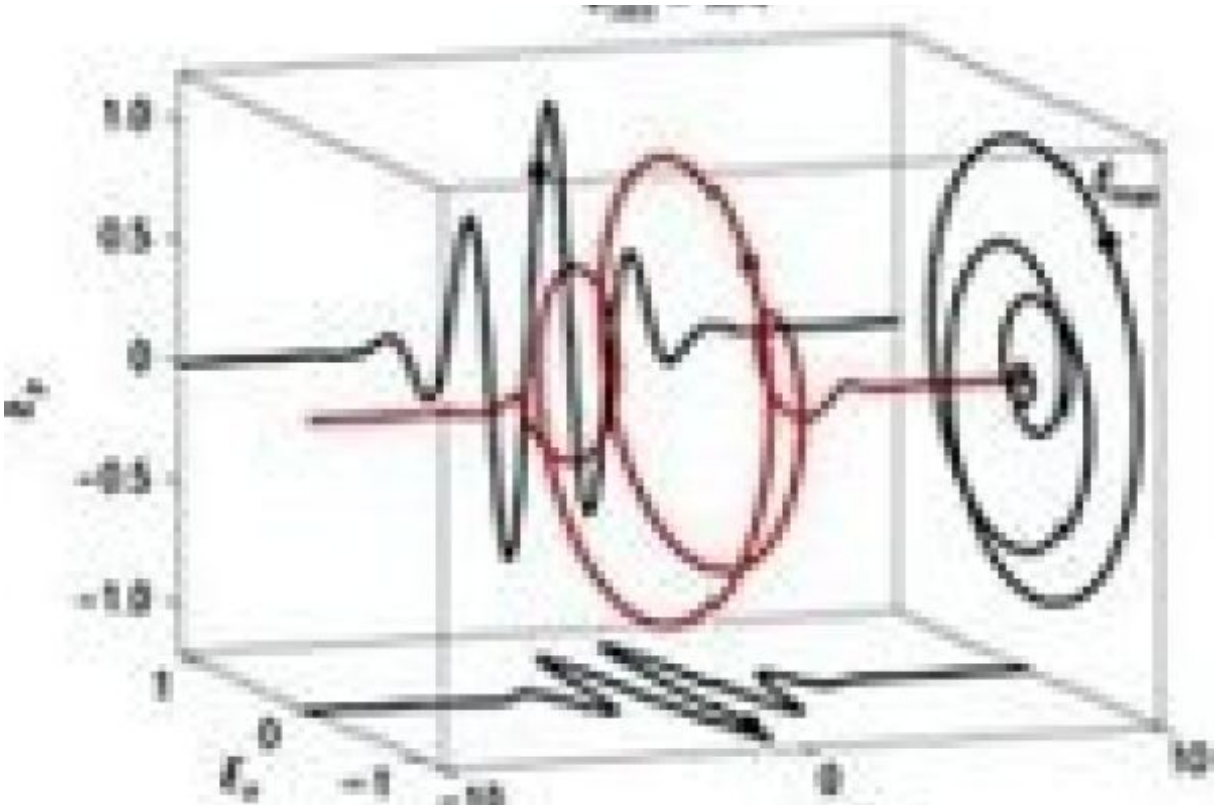


Attosecond Watches

Nature Physics reports on a landmark advance in ultrafast science co-authored by Prof. Biegert.

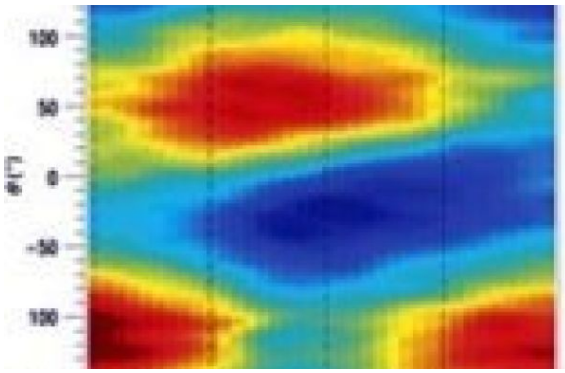
July 23, 2008

A new approach to achieving attosecond time resolution is the subject of a paper in Nature Physics, co-authored by the recently appointed ICFO group leader Prof. Jens Biegert. The work, developed when he was still at the Swiss Federal Institute of Technology (ETH), Zurich, proposes a new method for measuring and controlling the movement of electrons at the attosecond scale.

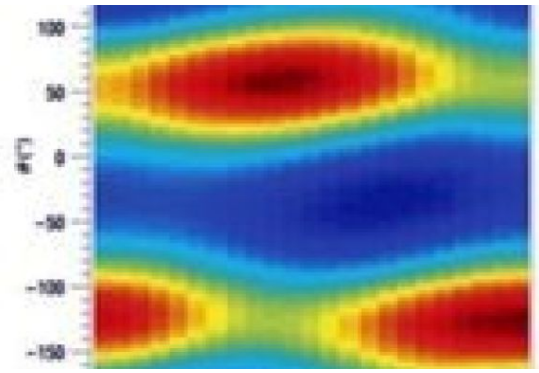
Ultrashort measurement-time resolution is traditionally obtained in pump-probe experiments, for which two ultrashort light pulses are required; the time resolution is then determined by the pulse duration. But although pulses of subfemtosecond duration are available, so far the energy of these pulses is too low to fully implement the traditional pump-probe technique. In their work in Nature Physics, Biegert and co-authors demonstrate attosecond angular

streaking, an alternative approach to achieving attosecond time resolution. The method uses the rotating electric field vector of an intense circularly polarized pulse to deflect photo-ionized electrons in the radial spatial direction; the instant of ionization is then mapped to the final angle of the momentum vector in the polarization plane. The authors resolved subcycle dynamics in tunneling ionization by the streaking field alone and demonstrated a temporal localization accuracy and a resolution that should enable the study of one of the fundamental aspects of quantum physics: the process of electron tunneling through an energetically forbidden region.

Jens Biegert, now ICREA research professor at ICFO, received the Optical Society of America?s Allen Prize in 2004.



Drives He+ momentum distributions



Theory