

## EINLADUNG

zum Vortrag

von

**Univ.Prof. Dr. Andrius Baltuska**  
Institut für Photonik der Technischen Universität Wien

über

# All-optical imaging of attosecond tunneling dynamics

am

**Dienstag, 13. Jänner 2009, um 17.30 Uhr**

Ort: Großer Hörsaal der Experimentalphysik, Universität Wien,  
1090 Wien, Strudlhofgasse 4 / Boltzmannngasse 5, 1. Stock

### Abstract:

In the presence of a high-intensity optical field, electrons are released from atoms on an attosecond time scale. Moreover, in the tunneling regime, this process displays a strong sensitivity to the carrier-envelope phase (CEP) of a few-cycle light pulse. We demonstrate a possibility of an all-optical mapping of attosecond ionization dynamics by use of few-cycle light pulses which in principle opens a way to time-resolve tunneling processes not only in gas targets but also in transparent bulk crystalline and glassy solids. Tunneling ionization - a fascinating quantum mechanical phenomenon - leads to a quasi-stepwise increase of free electron density and, as a consequence, of the refractive index of the medium. These steps of the refractive index, corresponding to half-cycles of the driving optical field, impose a transient attosecond phase mask. By scattering probe light off this mask we detect quasi-periodic higher-order harmonics, which, unlike the harmonics originating from intrinsic nonlinearity or driven by electron re-collisions, do not depend on the probe intensity and re-collision dynamics. We report the first experimental observation of this new type of harmonic generation signal at Photonics Institute of the TU Vienna and show how this type of spectral signature can be used to interpret tunneling ionization dynamics.