

## IRTG-Seminar



## Prof. Giuseppe Sansone

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### **“Attosecond and strong field physics: exploring the electronic dynamics on its natural timescale”**

When atoms and molecules are exposed to electric fields comparable to the coulomb field, electronic wave packets can be released in the continuum by tunneling ionization. The motion of the free electrons is driven by the external field and, depending on its characteristics and on the ionisation instant, different phenomena can occur, including diffraction on the parent ion (laser-induced electron diffraction), inelastic rescattering with the emission of a second electron (non-sequential double ionisation), or recombination with the ground state and emission of a photon (high-order harmonic generation).

The most important manifestation of the last one is the generation of trains and isolated attosecond ( $1\text{as} = 10^{-18}\text{ s}$ ) pulses. Attosecond pulses are the shortest reproducible events produced so far and their duration is rapidly approaching the atomic unit of time ( $1\text{ a.u.} = 24\text{ as}$ ), which represents the natural timescale of the electronic motion inside the atom in the Bohr model.

In my talk, I will first review some of the milestones leading to the reproducible generation and characterization of attosecond waveforms. Moreover, I will briefly discuss some of their first applications to pump-probe experiments. In the second part of my talk I will present some novel laser development and new research directions, we are planning to pursue in the new “Attosecond and Strong Field Physics” research group at the university of Freiburg.

**Tuesday, November 21, 2017, 1:00 p.m., HS II,  
Physics high rise, Hermann-Herder-Str. 3**