Generation and Application of Attosecond Pulses for Time Resolved Investigations in Atoms and Molecules.

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We present results on the generation of isolated attosecond pulses by shaping the time dependent ellipticity of a few-cycle carrier-envelope phase stabilized pulse. The control of the polarization state allows to steer the electron trajectories on the attosecond timescale, determining the numbers of recolliding electron wave packets down to the single recollision regime. Using this approach, isolated attosecond pulses have been generated in Xenon around 24 eV and used to create a complex electron wave packet in Helium with bound and continuum components that can be probed by using a synchronized infrared pulse.

The polarization gating technique can also be used to generate complex attosecond waveform such as double attosecond pulses, that could be implemented in novel attosecond spectroscopic techniques (such as transient absorption attosecond spectroscopy). We will present results indicating that the relative intensity and the relative phase of the two attosecond pulses can be separately influenced, by controlling the evolution in time of the polarization state of the driving pulse.