Continuum Attosecond Electron Wavepackets

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Strong field ionization produces free electron wave packets of a few hundred attosecond duration. These continuum electron wave packets are at the heart of attoscience. Using coincindence momentum spectroscopy, i.e. COLTRIMS, we study the spatial and temporal structure of these wave packets. We present experimental results that show how a two color laser field can be tailored to steer the wave packets on the attosecond time scale. The relative phase between the two frequencies can be used to determine the emission time of the wave packet. It also separates the direct electrons from re-collision electrons by their phase dependent lateral momentum. This approach permits attosecond collision experiments using multi cycle laser pulses [1].

Finally, the electron provides information about the electronic structure of its origin and therefore could be used to image orbitals with attosecond resolution.

[1] M. Kitzler and M. Lezius, PRL 95, 253001 (2005)