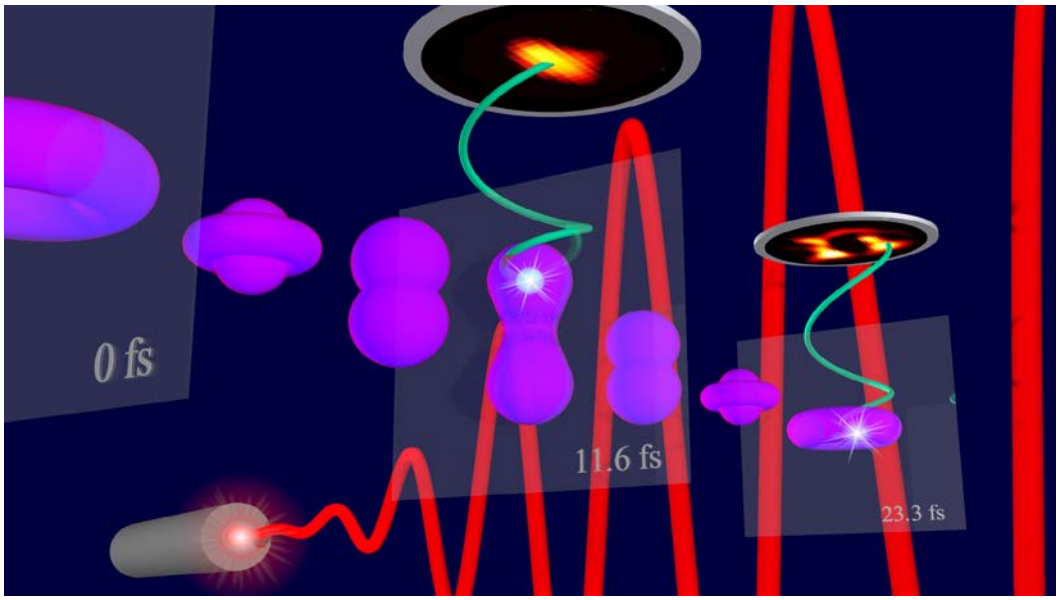
Master thesis

Non-linear Optics (Prof. Paulus)

Orbital imaging with photoelectrons

Intense laser pulses can ionize atoms or molecules by means of the quantum mechanical tunnel effect. This process can be use to image the valence orbital of an atom or molecule with ultrahigh spatial and temporal resolution.



Femtosecond laser pulses are used to record a movie of how electrons move within an argon ion, as they oscillate in a quantum beat of two fine-structure states.

This project aims at advancing photoelectron orbital imaging by exploring the effect of the laser wavelength on the obtained orbital images. For this purpose, molecules will be spatially aligned using a first laser pulse. A second, intense laser pulse will then image the molecular orbital by tunnel ionization.

We are looking for highly motivated students with an aptitude for research. A background in non-linear optics, lasers, and/or atomic and molecular physics is beneficial. Basic programming skills are expected. You will learn how to operate a state-of-the-art femtosecond laser system and how to measure two-dimensional photoelectron spectra from aligned molecules using a velocity map imaging spectrometer. Participation in external experimental campaigns is envisaged.

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For more information, see: https://chemistrycommunity.nature.com/users/210278-matthias-kubel/posts/44625-watching-electrons-move-inside-atoms-and-molecules

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