Chair of Attosecond and Strong Field Physics

https://www.atto.uni-freiburg.de/de

Master thesis

Development of experimental apparatus for investigation of liquid-state molecules using coincidence spectroscopy.

Relevant Tasks

- Design and construction of an apparatus for vaporizing water molecules
- Data acquisition

What we offer?

- High impact physics project
- Access to state-of-the-art attosecond sources
- Participation to experiments at large scale facilities

Required skills

- Bachelor in Physics or Engineering
- Curiosity and creativity

A master thesis is offered in the group of Attosecond and Strong Field Physics within the frame of project: Attosecond photoionization delays in the molecular frame.

Attosecond photoelectron interferometry is an established technique utilized to investigate dynamics in atoms and molecules. The combination of the photoelectron interferometry with coincidence spectroscopy allows the determination of attosecond photoionization time delays in the molecular frame. Our Lab has conducted such experimental works focused in investigating gas molecules.

Further information:
P. Carpeggiani et al. *Nat. Photon.* **11**, 383–389 (2017).
H Ahmadi et al *J. Phys. Photonics* **2** 024006 (2020).

A Cold Target Recoil Ion Momentum Spectroscopy (COLTRIMS) developed in close collaboration with the group of Dr. Moshammer at the Max-Planck Institute for Nuclear Physics in Heidelberg, is used to perform the kinematically complete scattering experiments. One of the key element of COLTRIMS is the use of supersonic gas jets to provide a cold gas target in the interaction region.

The goal of the project is to develop an experimental apparatus that allows the investigation of gas molecules that are in liquid state at room temperature, such as water or dichloromethane.

The tasks will focus on designing, building, implementing and testing the experimental apparatus in the current setup.

The project will focus on three aspects:

- Design and construction of an apparatus for vaporizing water molecules.
- Implementation of the apparatus and operation within the attosecond beamline
- Acquisition and analysis of the photoelectron spectra generated by the attosecond pulses using the COLTRIMS.

Interested, please contact

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