Five PhD positions at Uni Vienna and TU Wien

Basic Information:

We are now advertising four PhD positions within the cross-disciplinary Young Independent Research Group "Isolated Strong Optical Magnetic Pulse Spectroscopy" (iStOMPS), funded by the Austrian Science Fund (FWF) for the next four years. Two of these positions will be focused on experimental laser spectroscopy, based at the Photonics Institute of the Technical University of Vienna (TU Wien) and the Christian-Doppler-Laboratory for Mid-IR Spectroscopy and Semiconductor Optics at the University of Vienna (Uni Vienna). The two other positions will be working in the field of theoretical/computational chemistry and computational electrodynamics, working at the Institute of Theoretical Chemistry at the University of Vienna (Uni Vienna).

Project Information:

The interaction of the magnetic component of light with matter is several orders of magnitude weaker than the electric field-matter interaction. Therefore, often these magnetic interactions stay unexplored, although they follow different spectroscopic selection rules and therefore could provide complementary spectroscopic information. The aim of our project is to study interactions of the magnetic component of light with molecules by increasing the local contrast between magnetic and electric fields of ultrashort laser pulses through different experimental techniques. In parallel, we will study the details of the electromagnetic field propagation, the effect of the magnetic field pulses on molecules, and their subsequent ultrafast dynamics by advancing theoretical models.

The project will be conducted by 3 teams, working independently but in a close collaboration with each other and with international partners (Paul Scherrer Institute (Switzerland), University of Salamanca (Spain)).

Employment conditions:

- Gross salary: 2,237.60€ per month, paid 14 times per year, in accordance with the collective bargaining agreement of the universities §48 VwGr. B1 (praedoc).
- Taxes include medical and social insurance, PhD students are eligible to use all discounts and benefits available for Master/Bachelor students.
- No teaching duties.
- Main working language: English
- Work places at the University of Vienna and the campus of the TU Wien, both located in the city center.

Enrolment:

- We expect the successful candidates to sign doctoral thesis agreements within 12-18 months.

Both universities pursue non-discriminatory employment policies and value equal opportunities, as well as diversity (http://diversity.univie.ac.at/ and https://www.tuwien.at/tu-wien/tuw-fuer-alle/diversity/). The Young Independent Research Group puts emphasis on increasing the number of women in academic positions. Given equal qualifications, preference will be given to female applicants.

Magneto-Optical Spectroscopy with Cylindrical Vector Beams:

Working tasks for PhD Position 1 (at CDL for Mid-IR Spectroscopy and Semiconductor Optics, UniVie https://cdl-mid-infrared.univie.ac.at/):

- Experimental realization of magneto-optical frequency-comb absorption spectroscopy in near-IR/visible spectral range
- Enhancement of contrast between electric and magnetic fields
- Fiber-laser development

Working tasks for PhD Position 2 (at Ultrafast Laser Group, Photonics Institute, TU Wien http://atto.photonik.tuwien.ac.at/):

- Experimental realization of time-resolved emission spectroscopy with cylindrical vector beams in visible spectral range
- Experimental characterization and enhancement of longitudinal optical magnetic fields via induction of transient currents in metallic apertures

Requirements:

- Master degree in Physics/Engineering, preferably in a field of optics/photonics/electrical engineering
- Good knowledge of English (C1)
- Hands-on experience with solid-state/fiber lasers, pump-probe experiments, optical fibers, nonlinear optics, vector beams is a plus
- Knowledge of MATLAB/Python/LabView is a plus

If you are interested in this part of the project, please sent your CV and 1 recommendation letter to Dr. Valentina Shumakova: valentina.shumakova@tuwien.ac.at

If you didn't find a topic, which is matching to your interest, but would like to pursuit PhD-studies in the field of Ultrafast Nonlinear Optical Science and XUV-spectroscopy, please contact Dr. Paolo Antonio Carpeggiani for more information: paolo.carpegiani@tuwien.ac.at

XUV Spectroscopy with Isolated Magnetic Fields from Laser Pulse Collision

Working tasks (at Ultrafast Laser Group, Photonics Institute, TU Wien http://atto.photonik.tuwien.ac.at/):

- Experimental generating the XUV beam from high-order harmonic generation
- Experimental realization of the isolated magnetic field based on laser pulse collision
- Detecting the spectroscopy of lanthanide material caused by magnetic dipole

Requirements:

- Master degree in Physics/Engineering, preferably in a field of optics/photonics/quantum mechanics
- Good knowledge of English (C1)
- Hands-on experience with lasers or XUV spectrometers, or vacuum technique is a plus
- Knowledge of MATLAB/Python/LabView is a plus

If you are interested in this part of the project, please contact Dr. Hongtao Hu: hongtao.hu@tuwien.ac.at

Theory and Computations of Isolated Magnetic Field Spectroscopy

(Both positions are available at the González group, Institute of Theoretical Chemistry, University of Vienna https://theochem.univie.ac.at/):

Working tasks for PhD Position 1:

- Development of a computational protocol for the accurate simulation of magnetic dipole-allowed absorption and emission spectra
- Particle-in-cell simulations of the electromagnetic fields and charge currents in the experimental setups.
- Development and applications of a hybrid method combining particle-in-cell simulations with nonadiabatic molecular dynamics simulations

Working tasks for PhD Position 2:

- Simulation of magnetic dipole-allowed absorption spectra for lanthanide complexes and identification of other molecules with magnetic dipole-allowed transitions
- Simulation of XUV absorption spectra of molecules in the ground and excited electronic states
- Employing nonadiabatic dynamics simulations of magnetic-field-excited molecules to predict transient and time-dependent XUV spectra

Requirements:

- Master degree in Chemistry, Physics, or Computational Sciences, preferably with background in theoretical chemistry
- Good knowledge of English (C1)
- Hands-on experience with scientific computing, working on the Linux command line
- Knowledge of Fortran/Python/Scripting languages is a plus
- Ability to work in teams and communicate across disciplines with the experimental groups

If you are interested in this part of the project, please contact Dr. Sebastian Mai:
sebastian.mai@univie.ac.at