

## Call for Proposals

No. 80

13 November 2017

### **Priority Programme “Quantum Dynamics in Tailored Intense Fields (QUTIF)” (SPP 1840)**

In 2014, the Senate of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) established the Priority Programme “Quantum Dynamics in Tailored Intense Fields (QUTIF)” (SPP 1840). The programme is designed to run for six years. The present call invites proposals for the second three-year funding period.

In this Priority Programme, the dynamics of strongly perturbed quantum systems is to be investigated in the nonrelativistic regime with tailored radiation fields on the femtosecond and attosecond time scale. By combining experimental and theoretical expertise and bringing together the fields of optics, quantum dynamics and chemistry, the programme aims to achieve milestones such as the control and observation of subfemtosecond charge migration or the laser-based recognition and manipulation of chiral molecules. The main focus lies on gas-phase systems, in order to watch microscopic phenomena with minimal disturbance by their environment. Proposals for this Priority Programme should take the control of microscopic processes with light to a new level.

On the atomic physics side of this programme, fundamental issues are the interplay between multi-electron interactions and light-induced dynamics as well as the boundary between classical and quantum physics. The attosecond temporal structure of laser-induced ionisation may be analysed with a range of approaches going beyond existing attoclock and two-colour high-harmonic spectroscopy methods and extending these methods to multielectron dynamics. The electron spin in the strong-field regime, in particular the generation of spin-polarised electrons from laser ionisation is a possible subject of study.

The physics of molecular systems in intense few-cycle, multicolour and polarisation controlled light pulses is a mostly unexplored territory. One aim is to investigate the launch and observation of ultrafast charge migration – an electronic effect occurring faster than nuclear motion. Electron wave-packet dynamics can be controlled with tailored light, for example by exploiting the wavelength dependence of light-molecule interactions to suppress or enhance multiorbital dynamics or to reveal the low-energy structure in photoelectron spectra from mid-infrared irradiation. Laser-induced orientation of molecules may be established and used for applications.

In the realm of chemistry, tailored fields hold new opportunities for controlling chemical dynamics by nonresonant and resonant dynamic Stark shifts, tracing electron dynamics with attosecond

precision and for the recognition of the absolute configuration of chiral molecules. Via high-harmonic spectroscopy of molecules with suitably chosen fields, it may be possible to achieve ultrafast imaging of structure and dynamics on the sub-atomic length scale.

The application of strong tailored fields to solid-state systems and clusters in a quantum mechanical, i.e. non-plasma, regime holds many open questions. Strong-field processes in unconventional media such as exploding droplets doped with nanoparticles and in laser-induced filaments imply new perspectives such as alternative attosecond pulse sources and high-harmonic generation in inhomogeneous near fields.

Proposals must be written in English and submitted to the DFG by **14 March 2018**. Please note that proposals can only be submitted via elan, the DFG's electronic proposal processing system.

Applicants must be registered in elan prior to submitting a proposal to the DFG. If you have not yet registered, please note that you must do so by **28 February 2018** to submit a proposal under this call. Also, if you are planning to move to a different institution (e.g. with a temporary position for principal investigators) you need to register the new institutional address beforehand. You should receive confirmation of your registration by the next working day. Note that you will be asked to select the appropriate Priority Programme call during both the registration and the proposal process.

If you would like to submit a proposal for a new project within the existing Priority Programme, please go to Proposal Submission – New Project – Priority Programmes and select “SPP 1840” from the current list of calls. Previous applicants can submit a proposal for the renewal of an existing project under Proposal Submission – Proposal Overview/Renewal Proposal.

In preparing your proposal, please review the programme guidelines (form 50.05, section B) and follow the proposal preparation instructions (form 54.01). These forms can either be downloaded from our website or accessed through the elan portal. Please include a title page with your name, institution, and the title of your project in your application. A proposal template is available on the website of the Priority Programme. In addition to submitting your proposal via elan, please send an email with an electronic copy (PDF file) to the programme coordinator.

The review colloquium for the Priority Programme will be held on 5/6 July 2018 at the Physikzentrum Bad Honnef.

### **Further Information**

More information on the Priority Programme is available under:  
[www.qutif.de](http://www.qutif.de)

The elan system can be accessed at:  
<https://elan.dfg.de/en>

DFG forms 50.05 and 54.01 can be downloaded at:  
[www.dfg.de/formulare/50\\_05](http://www.dfg.de/formulare/50_05)  
[www.dfg.de/formulare/54\\_01](http://www.dfg.de/formulare/54_01)

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