Deutsche Forschungsgemeinschaft (German Research Foundation)
Information for Researchers

Calls for Proposals

No. 64 **5 November 2014**

Priority Programme "Quantum Dynamics in Tailored Intense Fields" (SPP 1840)

The Senate of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) has established the Priority Programme "Quantum Dynamics in Tailored Intense Fields" (SPP 1840). The programme is designed to run for six years; the present call invites proposals for the first 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.

On the atomic physics side of this programme, fundamental issues are the interplay between multielectron interactions and light-induced dynamics as well as the boundary between classical and quantum physics. The attosecond temporal structure of laser-induced ionization 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-polarized electrons from laser ionization is a possible subject of study.

The physics of molecular systems in intense few-cycle, multicolour and polarization 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.

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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 for this Priority Programme should take the control of microscopic processes with light to a new level, both in terms of temporal and spatial resolution as well as regarding the investigated systems.

Research proposals for the first three-year funding period, to be written in English, are now invited. All proposals should follow the guidelines in DFG form 50.05 (Priority Programmes, Part B) and 54.01 (Project Proposals). Please include a title page with your name, institution, and the title of your project in your application. The deadline for proposal submission is **11 March 2015**. A proposal template is available on the website of the Priority Programme.

Proposals must be submitted via the DFG's electronic submission system elan, selecting "SPP 1840". If you are using the elan system for the first time, please note that you need to register yourself and your institutional addresses before being able to submit a proposal. 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. Please make sure that all applicants of your project (in case there is more than one) start their registration at latest two weeks before the submission deadline. The registration requests are handled manually by DFG staff.

In addition to submitting your proposal to the DFG, please send an electronic version (pdf format) to the coordinator.

Please notice the rules for publication lists that have been modified recently: Beside the general bibliography every proposal includes a list of up to ten own publications that relate directly to the project. Further the number of publications that may be listed in any academic CV has been increased to up to ten as well. These publications need to be classified as a) refereed publications (published articles and monographs; accepted articles with note of acceptance by the journal) or b) other publications (e.g. publications on arXiv). Details can be found in DFG form 1.91.

A colloquium and review panel meeting are planned for June 2015.

Further information

For further information on the Priority Programme and for a proposal template please refer to:
http://www.qutif.de

The DFG's electronic proposal processing system "elan" with proposal instructions and guidelines can be found at:
https://elan.dfg.de

Proposal guidelines and preparation instructions are outlined in DFG forms 54.01en and 50.05en, part B, and guidelines for publication lists in DFG form 1.91en which can be found on the DFG's website at:
http://www.dfg.de/foerderung/formulare/

For scientific inquiries concerning the scope of the Priority Programme, please contact the programme's coordinator:
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