

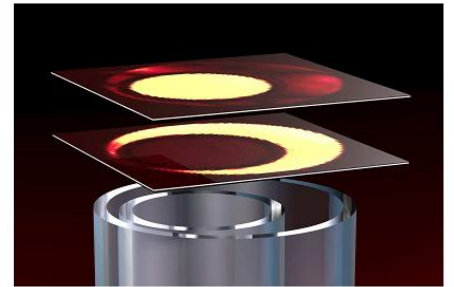


PhD Position 2015-2018:

Exploring the physical limits of spin dynamics: A challenge in Medical Imaging

A PhD position is opened at the Institute for Advanced Study of Technische Universität München (TUM-IAS) in the framework of a Hans Fisher fellowship (see the webpage <http://www.tum-ias.de/> for information). This position which will be co-advised by the TUM host Professor S. J. Glaser and the Hans Fisher fellow Professor D. Sugny, is also part of a general joint research project between the French group of Pr. D. Sugny (Laboratoire Interdisciplinaire Carnot de Bourgogne, Université de Bourgogne, France) and the German group of Pr. S. J. Glaser (Chemistry department, Technische Universität München). Interdisciplinary collaborations, in particular in the field of Mathematics and Medical Imaging will be involved during the position.

The goal of the project is to develop quantum optimal control techniques and to investigate their applications in spin dynamics and in Magnetic Resonance Imaging. Particular mathematical focus will be on the optimal control of an inhomogeneous ensemble of spins which is one of the key problems in order to design robust control fields with respect to experimental imperfections. Within facilities in medical imaging of the TUM, one major objective of the student will be to apply numerically computed control fields to relevant medical imaging experiments in order to demonstrate the potential of this approach. A first step has been made in 2012 in this direction by the French-German consortium with the maximization of the contrast of an image in an *in vitro* experiment (see the enclosed figure). This research project will cover aspects of geometric and numerical optimizations, computational and theoretical physics, but will also have a strong interaction with experimentalists working in chemistry and medical imaging.



Applicants must hold a Master's Degree or equivalent in Theoretical physics, Theoretical chemistry, Mathematics or Engineering. Some background in quantum systems and non linear classical dynamics is expected but not mandatory. A scientific interest in computational physics will be very helpful. Good English skills are required. Applicants should provide an application letter, a one-page statement of scientific interests, their CV (including a complete list of exams and corresponding grades) and Master's Thesis, a bibliography of published work, a letter of recommendation, and names (with email-addresses) of at least two additional references. All documents should be sent as a pdf file via e-mail to Pr. D. Sugny.

Prof. Dr. Dominique Sugny (Hans Fisher fellowship)
Laboratoire Interdisciplinaire Carnot de Bourgogne
Université de Bourgogne
Dominique.sugny@u-bourgogne.fr

Prof. Dr. Steffen J. Glaser
Chemistry department
Technische Universität München
glaser@tum.de