



PhD Program between the Freie Universität Berlin (FUB) and the China Scholarship Council (CSC) Open PhD position for CSC scholarship candidates 2015

The PhD position is only offered to Chinese PhD candidates for application in the framework of the FU-CSC Program.

<u>Department/Institute:</u>	Department of Mathematics & Computer Science, Institute of Mathematics
<u>Subject area:</u>	Scientific Computing / Numerical Analysis, Applied Stochastics
<u>Name of Supervisor:</u>	Prof. Carsten Hartmann
<u>Number of open positions:</u>	1 (Full-time / 3-4 y. OR Part-time / 1-2 y. PhD study)
<u>Project title:</u>	Model and dimension reduction for open quantum
<u>Project description:</u>	

The aim of this PhD project aims at the development of efficient model and dimension reduction methods for the simulation of open quantum systems that occur in the light-induced control of electron dynamics. Construction of reduced systems accounts for both the sensitivity of the quantum states to the light field (controllability) and coupling to selected target states (observability) on an equal footing. Although such *balanced model reduction* approaches are well-established for linear systems, their generalization to quantum control problems that involve bilinear couplings between external fields and quantum densities is yet open. The key questions to be addressed in the PhD project are:

1. Structure-preservation: Is it possible to devise model reduction schemes for open quantum systems that preserve the algebraic structure of the equations and preserve physical properties, such as probability conservation or energy dissipation?
2. Closed-loop stability: Is it possible to use reduced-order models to compute optimal control loops that are accurate enough to control the original (high-dimensional) dynamics, for which computing optimal controls is typically infeasible?

Language requirements:

The PhD thesis will be written in English. No knowledge of German, but a good knowledge of English is needed.

Academic requirements:

Master's degree in mathematics, with a focus on numerical and/or stochastic analysis. Some knowledge of control theory and numerical linear algebra would be helpful, but is not mandatory.

Link to professor and further information:

Group webpage: <http://www.mi.fu-berlin.de/en/math/groups/stochastics/index.html>
Personal webpage C. Hartmann: <http://page.mi.fu-berlin.de/chartman/>

Please note:

In a first step the complete application should submit to the Beijing Office for evaluation by January 4th. Please don't contact the professor before. He will get in contact with you after having received the complete application in January.