

Kolloquium des SFB/TR 49 gemeinsam mit Theoretisch-Physikalischem Kolloquium

Donnerstag, den 17.05.2018 um 15:30 Uhr in Raum 46-576

Quantum Spin Systems far from equilibrium – Theory and applications

Prof. Igor Lesanovsky

Faculty of Science, University of Nottingham, UK

Cold atomic gases are a versatile platform for the study of non-equilibrium phenomena in quantum many-body systems. Especially atoms excited to highly-lying electronic states - so-called Rydberg atoms. They form the building blocks of the most recent generation of quantum simulators and offer rather intriguing opportunities for exploring strongly correlated dynamics in interacting spin systems.

I will present an overview of the research that our group has conducted on this topic in the past years. I will show that the out-of-equilibrium behaviour of Rydberg gases is governed by emergent kinetic constraints. Such constraints are often used to mimic dynamical arrest or excluded volume effects in idealised models of glass forming substances and lead to a remarkably rich physics including non-equilibrium phase transitions and localisation phenomena. Moreover, Rydberg gases offer intriguing opportunities for the systematic exploration of the role of competing quantum and classical dynamical effects on non-equilibrium phase transitions.

I will conclude by discussing how the above findings can be employed to gain a new perspective on the physics of Dynamic Nuclear Polarisation in interacting electronic and nuclear ensembles, which is an out-of-equilibrium method to drastically enhance the performance of Magnetic Resonance Imaging applications.