SFB 910 Symposium

"Controlling quantum machines"

Friday, 25th June 2021, 15:00 s.t.
via Zoom
Please contact henning.reinken@itp.tu-berlin.de
for the link/Meeting ID.

Technische Universität Berlin
Straße des 17. Juni 135, 10623 Berlin

15:00 **Controlling the stability of quantum thermal machines**

Prof. Dr. Eric Lutz *(Universität Stuttgart)*

15:50 **Cooling and simulation of a finite-temperature bath in an optical lattice via Markovian feedback control**

Dr. Ling-Na Wu *(TU Berlin)*

16:20 **Majoranas - dream or desaster?**

Prof. Dr. Felix von Oppen *(FU Berlin)*

Guests are welcome!

Sabine Klapp   Bernold Fiedler

http://www.itp.tu-berlin.de/sfb910/

Abstracts

Controlling the stability of quantum thermal machines

Prof. Dr. Eric Lutz *(Universität Stuttgart)*

Stability is an important property of small thermal machines with fluctuating power output. We consider a finite-time quantum Carnot engine based on a degenerate multilevel system and study the influence of its finite Hilbert space structure on its stability. We optimize its relative power fluctuations with respect to level degeneracy and level number and find that its optimal performance may surpass those of nondegenerate two-level engines or harmonic oscillator motors. We further present an experimental investigation of the stability of a quantum Otto engine realized in the large quasi-spin states of Cesium impurities immersed in an ultracold Rubidium bath. We concretely use full-counting statistics of individual atoms to monitor quantized heat exchange between engine and bath at the level of single quanta. We optimize the performance as well as the stability of the quantum heat engine, achieving high efficiency, large power output and small power output fluctuations.

Cooling and simulation of a finite-temperature bath in an optical lattice via Markovian feedback control

Dr. Ling-Na Wu *(TU Berlin)*

We propose and investigate a scheme for in-situ cooling a system of interacting bosonic atoms in a one-dimensional optical lattice without particle loss. It is based on Markovian feedback control. The system is assumed to be probed weakly via the homodyne detection of photons that are scattered off-resonantly by the atoms from a structured probe beam into a cavity mode. By applying an inertial force to the system that is proportional to the measured signal, the system can be guided into a pure target state. Cooling is achieved by preparing the system's ground state, but also excited states can be prepared. While the approach always works for weak interactions, for integer filling the ground state can be prepared with high fidelity for arbitrary interaction strengths. The scheme is found to be robust against reduced measurement efficiencies. We also propose a similar scheme to simulate a finite temperature bath.

Majoranas - dream or desaster?

Prof. Dr. Felix von Oppen *(FU Berlin)*

Recently, it has made news that a Nature paper reporting experimental evidence of Majorana bound states has been retracted. In this talk, I will briefly discuss where this leaves the field.