Experimental implementation of a quantum heat engine and its optimization

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Abstract

We will present an experimental implementation of a quantum engine, where the work substance is a spin-1/2 system in a molecular sample. Employing Nuclear Magnetic Resonance (NMR) techniques, we have implemented and completely characterized all energy fluctuations in the non-equilibrium operation of a spin quantum engine performing an Otto like cycle. The full statistics of work and heat as well as the operational limits of such an engine will be discussed. We will also show an optimized (frictionless) version of the engine employing a super-adiabatic driving which suppress the entropy production along the thermodynamic cycle. Finally, we will present the perspectives of future experiments employing quantum thermodynamic cycles in our NMR setup.

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