
Information thermodynamics in a hybrid opto-mechanical system

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Abstract

Information thermodynamics is a recent field that investigates the links between information and energy. Its most famous "Gedankenexperiments" are Landauer erasure and Szilard engine, that describe the reversible conversion of a single bit of information into an elementary amount of work between a system and a battery. So far, direct evidences of such reversible work exchanges by measuring the battery's energy has remained elusive. We show that a hybrid optomechanical transducer is a proper platform to monitor these conversions. Such devices consist in an optically active quantum emitter, playing the role of the bit, coupled to a mechanical resonator, playing the role of the battery. Heat is exchanged with the electromagnetic reservoir. Within a mechanical oscillation, we relate the entropy variations of the quantum emitter to the mechanical energy variations, that are identified with work exchanges. These results pave the road towards experimental investigation of thermodynamics of quantum information.

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