Coherence and measurement in quantum thermodynamics

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Abstract

The link between classical information theory and thermodynamics was established by Landauer half a century ago. In this talk we describe a prototypical *quantum* information processing task that mirrors Landauer's erasure and has an associated thermodynamic heat and work. We show that when implementing this process it is possible to draw *positive* mean work from quantum *coherences* while there is no such contribution in classical thermodynamics [1]. The achievability of this maximum work is exemplified for spin 1/2 particles that undergo a sequence of quantum thermodynamic steps, i.e. the system follows a discrete quantum trajectory [2]. The results are discussed in the context of Maxwell's demon, quantum work fluctuation relations [3] and single-shot approaches [4], uncovering a new perspective on the role of coherences in quantum thermodynamics.

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