Quantum thermal machines with single nonequilibrium environments

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Abstract

We propose a scheme which allows, for the first time, to overcome all the common obstacles in the realization of quantum absorption tasks by exploiting non-equilibrium properties of an electromagnetic field in a rich yet simple configuration fully within experimental reach. Guided by the laws of (quantum) thermodynamics, we show how our machines deliver all thermodynamic tasks (cooling, heating and population inversion) by establishing quantum coherences with the body on which they act. Their efficiency at maximum power remarkably approaches the Carnot limit, offering a new paradigm for efficient quantum energy flux management.

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