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Efficiency of thermodynamic processes in the presence of Non-Markovian system-bath interactions JIALUN LUO, HIL FUNG HARRY CHEUNG, YOGESH S PATIL, MUKUND VENGALATTORE, Cornell University — In the presence of Markovian system-bath interactions, the efficiency of a thermodynamic or quantum heat engine is bound by established limits such as the Carnot limit and the Curzon-Ahlborn bound. However, it has been theorized that these bounds can be violated in the presence of non-equilibrium or non-Markovian system-bath dynamics. We demonstrate an optomechanical realization of such a non-Markovian heat engine, and describe the performance of this heat engine in various parameter regimes. We also propose an experimental implementation of this concept in the quantum limit in a hybrid quantum system that couples a cavity optomechanical device to an ultracold spin ensemble. These experiments can potentially shed light on generalized quantum thermodynamics bounds for quantum heat engines.

Hil Fung Harry Cheung
Cornell University

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