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Many-body quantum heat engines based on free-fermion systems

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We study the performances of an imperfect quantum many-body Otto engine based on free-fermion systems. Starting from the thermodynamic definitions of heat and work along ideal isothermal, adiabatic, and isochoric transformations, we generalize these expressions in the case when the hypotheses of ideality are relaxed (i.e., nonperfect thermalization with the external baths, as well as nonperfect quantum adiabaticity in the unitary dynamic protocols). These results are used to evaluate the work and the power delivered by an imperfect quantum many-body heat engine in a finite time, whose working substance is constituted by a quantum Ising chain in a transverse field: We discuss the emerging optimal working points as functions of the various model parameters.

Title

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