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Optimal energy conversion through anti-adiabatic driving

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A key question for the development of quantum thermos-machines and more generally of quantum technologies is what are the ultimate bounds to the performance of heat engines. We have shown [1] that in the antiadiabatic limit a periodically driven isothermal heat engine can approach the ideal (unit) energy conversion efficiency with finite output power and vanishingly small relative power fluctuations. The simultaneous realization of all three desiderata of a heat engine is possible thanks to the breaking of time-reversal symmetry. Moreover, non-Markovian dynamics, obtained by suitably engineering the bath, can further improve the power-efficiency trade-off.

[1] L. M. Cangemi, M. Carrega, A. De Candia, V. Cataudella, G. De Filippis, M. Sassetti, and G. Benenti, Phys. Rev. Res. ***3***, 013237 (2021).

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