

Quantum thermodynamics of localized relativistic quantum systems

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Quantum systems are reaching operational regimes where they can be employed to develop novel quantum technologies. In order for this endeavour to succeed, it is paramount to quantify the quality of any new technology in terms of efficiency. While classical thermodynamics has allowed us to well characterize classical systems to date, novel concepts need to be introduced and developed within the realm of quantum mechanics

Quantum thermodynamics extends concepts from its classical counterpart to regimes where very few small constituents interact, and fluctuations around the mean values of relevant quantities are important. We employ techniques and tools from this field to characterize localized relativistic and quantum systems that act as quantum thermal machines. We focus on quantum fields trapped in cavities with moving boundaries, where potentially finite-dimensional probes can be located to extract energy from the field. We discuss current work and outlook for future applications.