

Measurement-based quantum heat engine in a multilevel system

Maron F Anka, Daniel Jonathan, and Thiago Rodrigues de Oliveira

Universidade Federal Fluminense, Av. Litoranea, S/N, Niteroi, Brazil

We compare quantum Otto engines based on two different cycle models: a two-bath model, with a standard heat source and sink, and a measurement-based protocol, where the role of heat source is played by a quantum measurement. We furthermore study these cycles using two different “working substances”: a single qutrit (spin-1 particle) or a pair of qubits (spin-1/2 particles) interacting via the XXZ Heisenberg interaction. Although both cycle models have the same efficiency when applied on a single-qubit working substance, we find that both can reach higher efficiencies using these more complex working substances by exploiting the existence of “idle” levels, i.e., levels that do not shift while the spins are subjected to a variable magnetic field. Furthermore, with an appropriate choice of measurement, the measurement-based protocol becomes more efficient than the two-bath model