

Quantum heat engine with weak and strong coupled baths

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We investigate the effect of interplay between strong and weak coupling between the quantum system and the phonon bath. Typically multiple baths are coupled to the same energy transitions in a quantum heat engine. A four-level laser quantum heat engine has various transitions coupled to different baths. Polaron master equation is used and all the other components of dynamics such as dissipation, heat and work are also transformed to the polaron frame consistently. Asymptotic analytical formalism allows to understand the system dynamics and steady state behavior in the limiting cases of the strong and weak coupling. Power, efficiency and efficiency at maximum power show the effect of strong coupled bath and significantly enhanced bounds of the performance compared to the weak coupling regime.