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Quantum Otto engine using a single ion and a single thermal bath ASOKA BISWAS, SUMAN CHAND, Indian Institute of Technology Ropar — Quantum heat engines employ a quantum system as the working fluid, that gives rise to large work efficiency, beyond the limit for classical heat engines. Existing proposals for implementing quantum heat engines require that the system interacts with the hot bath and the cold bath (both modelled as a classical system) in an alternative fashion and therefore assumes ability to switch off the interaction with the bath during a certain stage of the heat-cycle. However, it is not possible to decouple a quantum system from its always-on interaction with the bath without use of complex pulse sequences. It is also hard to identify two different baths at two different temperatures in quantum domain, that sequentially interact with the system. Here, we show how to implement a quantum Otto engine without requiring to decouple the bath in a sequential manner. This is done by considering a single thermal bath, coupled to a single trapped ion. The electronic degree of freedom of the ion is chosen as a two-level working fluid while the vibrational degree of freedom plays the role of the cold bath. Measuring the electronic state mimics the release of heat into the cold bath. Thus, our model is fully quantum and exhibits very large work efficiency, asymptotically close to unity.

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