

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Autonomous quantum thermal machines and quantum to classical energy flow MAX FRENZEL, DAVID JENNINGS, TERRY RUDOLPH, Imperial College London — We address the issue of autonomous quantum thermal machines that are tailored to achieve some specific thermodynamic primitive, such as work extraction in the presence of a thermal environment, while having minimal or no control from the macroscopic regime. Beyond experimental implementations, this provides an arena in which to address certain foundational aspects such as the role of coherence in thermodynamics, the use of clock degrees of freedom and the simulation of local time-dependent Hamiltonians in a particular quantum subsystem. For small-scale systems additional issues arise. Firstly, it is not clear to what degree genuine ordered thermodynamic work has been extracted, and secondly non-trivial back-actions on the thermal machine must be accounted for. We find that both these aspects can be resolved through a judicious choice of quantum measurements that magnify thermodynamic properties up the ladder of length-scales, while simultaneously stabilizing the quantum thermal machine. Within this framework we show that thermodynamic reversibility is obtained in a particular Zeno limit, and finally illustrate these concepts with a concrete example involving spin-systems.

Max Frenzel
Imperial College London

Date submitted: 02 Nov 2015

Electronic form version 1.4