Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Quantum coherence, time-translation symmetry and thermodynamics KAMIL KORZEKWA, MATTEO LOSTAGLIO, DAVID JENNINGS, TERRY RUDOLPH, Imperial College London — The first law of thermodynamics imposes not just a constraint on the energy content of systems in extreme quantum regimes but also symmetry constraints related to the thermodynamic processing of quantum coherence. We show that this thermodynamic symmetry decomposes any quantum state into mode operators that quantify the coherence present in the state. We then establish general upper and lower bounds for the evolution of quantum coherence under arbitrary thermal operations, valid for any temperature. We identify primitive coherence manipulations and show that the transfer of coherence between energy levels manifests irreversibility not captured by free energy. Moreover, the recently developed thermomajorization relations on block-diagonal quantum states are observed to be special cases of this symmetry analysis.

Kamil Korzekwa
Imperial College London

Date submitted: 27 Oct 2015 Electronic form version 1.4