Relaxation towards negative absolute temperature states
STEPHAN MANDT, Princeton University, ADRIAN FEIGUIN, Northeastern University, SALVATORE MANMANA, University of Goettingen — Motivated by the recent experimental observation of negative absolute temperature states with ultracold atoms in optical lattices, [Braun et al., Science 339 52 (2013)], we discuss the formation of these states. More specifically, we consider the relaxation after a sudden inversion of the external parabolic confining potential. First, previous numerical simulation results of a semiclassical Boltzmann equation for the case of fermions will be discussed, which show a surprisingly slow equilibration due to the diffusive rearrangement of the local kinetic energies in the inhomogeneous system. We then focus on the integrable system of one-dimensional hard-core bosons. Here, we provide convincing numerical evidence for the relaxation to a generalized Gibbs ensemble at negative absolute temperature, a notion we define in this context.

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