Relaxation and recurrence of an isolated quantum many-body system

Bernhard Rauer
Vienna Center for Quantum Science and Technology, University of Vienna, Austria

Relaxation dynamics in isolated quantum many-body systems is a highly active research topic with relevance for many different fields of physics. In particular, cold atomic gases developed into a versatile testbed for the investigation of this dynamics. Our model system is a degenerate 1d Bose gas. Over the last years, we developed techniques to characterize its relaxed states and the dynamics leading to them.

We take our system out of equilibrium by coherently splitting it into two parts. During the subsequent evolution we monitor the relative phase field of the two condensates, providing a local probe for the system. This allows us to directly observe how the initial coherence between the two many-body systems is lost and how a steady state emerges. We explicitly show that this steady state is described by a generalized Gibbs ensemble. Furthermore, by confining the gas to a box shaped potential we are able to observe a partial recurrence of the initial state. .