

Séminaire de physique statistique

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Orme des Merisiers Salle Claude Itzykson, Bât. 774

Quantum Work of Optical Lattices

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A typical quench experiment consists of a sudden release of a cold atomic gas from an optical lattice. The local properties of the quench dynamics have been extensively studied, however the global properties of this non-equilibrium quantum systems have received less attention. Here we study some aspects of global non-equilibrium behavior by calculating the amount of work done by the quench as measured through the work distribution function.

Using Bethe Ansatz techniques we determine the Loschmidt echo and from it the work distribution function of a gas of bosons initially held in a deep periodic potential and subsequently either the potential is completely removed (process described by the Lieb-Liniger model) or lowered (process described by the Sine-Gordon model). We find the average work and its universal edge exponents at threshold and determine the long time decay of the Loschmidt echo. We highlight striking differences caused by the interactions as well as the changes in the geometry of the system. We study repulsive as well as attractive interactions. In particular we examine the prominent role played by bound states in the work distribution and show that, with low probability, they allow for negative work to be extracted from the quench.
