UNIVERSITÀ DI TRENTO
Dipartimento di Fisica

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Thursday, 08 February 2024: 2:00 p.m.

Aula seminari grande - Palazzina B – via alla Cascata 56 C

BEC seminar:

Evolution of entanglement entropy in strongly correlated bosons in an optical lattice

Abstract

We investigate the time evolution of the second-order Rényi entropy (RE) for bosons in a one-dimensional optical lattice following a sudden quench of the hopping amplitude [1]. Specifically, we examine systems that are quenched into the strongly correlated Mott-insulating (MI) regime from the MI limit. In this regime, the low-energy excited states can be effectively described by fermionic quasiparticles known as doublons and holons. They are excited in entangled pairs through the quench dynamics. By developing an effective theory, we derive a relation between the RE and correlation functions associated with doublons and holons. This relation allows us to analytically calculate the RE and obtain a physical picture for the RE in terms of doublon holon pairs. We show that RE is proportional to the population of doublon-holon pairs that span the boundary of the subsystem. Our quasiparticle picture introduces some remarkable features that are absent in previous studies on the dynamics of entanglement entropy in free-fermion models. It provides valuable insights into the dynamics of entanglement entropy in strongly-correlated systems.

[1] Phys. Rev. Research 5, 043102 (2023)

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