From the classical to the quantum Kibble-Zurek scaling

Fri, 2016-03-04 11:52 - Werner Weiss [1] **Date:** 2015-10-27

Author(s):
P. Silvi, G. Morigi, T. Calarco, S. Montangero

Reference:
arXiv:1510.07941

URL:
http://arxiv.org/abs/1510.07941 [2]

The Kibble-Zurek (KZ) hypothesis identifies the relevant time scales in out-of-equilibrium dynamics of critical systems employing concepts valid at equilibrium: It predicts the scaling of the defect formation immediately after quenches across classical and quantum phase transitions as a function of the quench speed. Here we study the crossover between the scaling dictated by a slow quench, which is ruled by the critical properties of the quantum phase transition, and the excitations due to a faster quench, where the dynamics is often well described by the classical model. We estimate the value of the quench rate that separates the two regimes and support our argument using numerical simulations of the out-of-equilibrium many-body dynamics. For the specific case of a ϕ4 model we demonstrate that the two regimes exhibit two different power-law scalings, which are in agreement with the KZ theory when applied to the quantum and to the classical case. This result contributes to extending the prediction power of the Kibble-Zurek mechanism and to provide insight into recent experimental observations in systems of cold atoms and ions.

- 12.10.+i Simulations of many-body interactions [3]
- H2020 [4]
- QIPC [5]
- RySQ [6]
- 15.10.En Atomic ensembles [7]
- Result [8]
- SIQS [9]

Source URL: http://qurope.eu/db/publications/classical-quantum-kibble-zurek-scaling

Links:
[1] http://qurope.eu/users/wweiss
[2] http://arxiv.org/abs/1510.07941
[3] http://qurope.eu/category/qics/10-quantum-computation/12-simulations/1210i-simulations-many-body-interactions
[4] http://qurope.eu/category/european-commission/h2020
[5] http://qurope.eu/category/qipc/qipc
[6] http://qurope.eu/category/projects/rysq
[7] http://qurope.eu/category/qics/10-quantum-computation/15-implementations-quantum-optics/1510en-atomic-ensembles
[8] http://qurope.eu/category/attribute/result
[9] http://qurope.eu/category/projects/ips/siqs