

Scaling of a long-range interacting quantum spin system driven out of equilibrium

Thu, 2016-08-04 11:35 - [Shannon Whitlock](#) [1] **Date:** 2016-08-03

Author(s):

S. Helmrich, A. Arias, S. Whitlock

Reference:

arXiv:1605.08609

URL:

<http://arxiv.org/abs/1605.08609> [2]

Complex systems are often found to exhibit unexpectedly simple scaling laws that can signal new physical regimes or universal relations between otherwise very different systems. Although this provides a powerful tool for characterising systems close to equilibrium, there are only few known examples where scaling behaviour can be found in dynamical settings. Here we demonstrate power-law scaling in a well-controlled quantum spin system driven out of equilibrium. This enables us to reconstruct the non-equilibrium phase diagram of the system and identify dissipation-dominated, driving-dominated and interaction-dominated regimes. The measured scaling laws show signatures of the underlying ground state phase structure, including paramagnetic behaviour, quantum critical behaviour and a magnetic instability towards states with strong spatial correlations. This opens up a new means to study and classify quantum systems out of equilibrium and extends the domain where scale-invariant behaviour can be found.

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

Source URL:

<http://qurope.eu/db/publications/scaling-long-range-interacting-quantum-spin-system-driven-out-equilibrium>

Links:

[1] <http://qurope.eu/users/whitlock>

[2] <http://arxiv.org/abs/1605.08609>

[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/virtual-institute/quantum-simulation>