Contribution ID: **87** Type: **Parallel Talk**

# Investigating dynamical quantum phase transitions in the massive Thirring model using matrix product states

*Friday, 4 August 2023 09:40 (20 minutes)*

We present our study of real-time dynamics and dynamical quantum phase transition (DQPT) in the (1+1)-dimensional massive Thirring mode using matrix product states (MPSs). Lattice regularisation of this model with Kogut-Susskind fermions corresponds to the XXZ spin chain with the presence of a constant and a staggered magnetic fields. In this work, we implement methods of variational uniform MPS and time-dependent variational principle for this spin chain. This allows us to carry out simulations directly in the thermodynamic limit. The search for DQPT is performed through examining effects of a global quantum quench on the Loschmidt echo along the real-time evolution of an initial ground state of the system. We show evidence of the connection between the occurrence of DQPT and the eigenvalue spectrum of a mixed transfer operator. Furthermore, we find that the presence of DQPT is closely related to the effective temperature of the initial state, defined as the temperature of the thermal equilibrium state with the same energy density.

## Topical area

Quantum Computing and Quantum Information

**Primary author:** Prof. LIN, C.-J. David (National Yang Ming Chiao Tung University)

**Co-authors:** Mr SINGH, Amit (University of Manchester); Mr HUNG, Hao-Ti (National Taiwan University); Prof. CICHY, Krzysztof (Adam Mickiewicz University); Dr BANULS, Mari Carmen (Max Planck Institute of Quantum Optics); Prof. KAO, Ying-Jer (National Taiwan University)

**Presenter:** Prof. LIN, C.-J. David (National Yang Ming Chiao Tung University)

**Session Classification:** Quantum Computing and Quantum Information