

Michael Sonner

Resumé

Employment

2024– **Postdoc**, *Max Planck Institute for the Physics of Complex Systems*, Dresden, Germany

Education

2019–2024 **PhD**, *Université de Genève*, Geneva, Switzerland

2017–2019 **Master of Science**, *KIT*, Karlsruhe, Germany

2015–2016 **Exchange year**, *NTNU*, Trondheim, Norway

2013–2017 **Bachelor of Science**, *KIT*, Karlsruhe, Germany, *with distinction (1.0)*

PhD thesis

title *The Influence Matrix Approach to Quantum Many-Body Dynamics*

supervisor D. A. Abanin

description We develop a framework for the simulation of the time evolution of local operators by compressing the influence functional of quantum baths as matrix product states

Master thesis

title *Numerical studies of Topological Phases 1D systems*

supervisor A. D. Mirlin

description We study the effects of disorder on an interacting 1D chain of Majorana fermions using various analytical and numerical methods.

Bachelor thesis

title *Fractal phases on Cayley trees*

supervisor A. D. Mirlin

description The statistics of eigenfunctions on disordered finite Cayley trees is investigated.

Scholarships and prizes

2013 International Physics Olympiad, bronze medal

2013–2019 Scholarship of the German National Merit Foundation (Studienstiftung des deutschen Volkes)

Publications

I. A. Luchnikov, **M. Sonner** and D. A. Abanin Scalable tomography of many-body quantum environments with low temporal entanglement *Preprint* arXiv:2406.18458 (2024).

B. Kloss*, J. Thoenniss*, **M. Sonner**, A. Lerosé, M. T. Fishmann, E. .M. Stoudenmire, O. Parcollet, A. Georges and D. .A. Abanin, Equilibrium Quantum Impurity Problems via Matrix Product State Encoding of the Retarded Action *Physical Review B* 108, 205110 (2023).

J. Thoenniss*, **M. Sonner***, A. Lerose, and D. .A. Abanin, Efficient Method for Quantum Impurity Problems out of Equilibrium *Physical Review B* 107.20 L201115 (2023).

X. Mi, **M. Sonner** et. al., Noise-Resilient Majorana Edge Modes on a Chain of Superconducting Qubits *Science* 378.6621 785–790 (2022).

M. Sonner*, A. Lerose*, and D. A. Abanin, Characterizing Many-Body Localization via Exact Disorder-Averaged Quantum Noise *Physical Review B* 105.2 L020203 (2022). (Editor’s suggestion)

A. Lerose, **M. Sonner**, and D. A. Abanin Overcoming the Entanglement Barrier in Quantum Many-Body Dynamics via Space-Time Duality, *Physical Review B* 107.6, L060305 (2023).

G. Giudice*, G. Giudici*, **M. Sonner***, J. Thoenniss, A. Lerose, D. A. Abanin, and L. Piroli, Temporal Entanglement, Quasiparticles, and the Role of Interactions, *Physical Review Letters* 128, 220401 (2022).

M. Sonner, M. Serbyn, Z. Papić, and D. A. Abanin, Thouless Energy across the Many-Body Localization Transition in Floquet Systems, *Physical Review B* 104.8, L081112 (2021).

M. Sonner*, A. Lerose*, and D. A. Abanin, Influence Functional of Many-Body Systems: Temporal Entanglement and Matrix-Product State Representation, *Annals of Physics* 435, 168677 (2021).

A. Lerose, **M. Sonner**, and D. A. Abanin, Scaling of Temporal Entanglement in Proximity to Integrability, *Physical Review B* 104.3, 035137 (2021).

A. Lerose*, **M. Sonner***, and D. A. Abanin, Influence Matrix Approach to Many-Body Floquet Dynamics *Physical Review X* 11.2, 021040 (2021).

J. F. Karcher*, **M. Sonner***, and A. D. Mirlin, Disorder and Interaction in Chiral Chains: Majoranas versus Complex Fermions *Physical Review B* 100.13, 134207 (2019).

M. Sonner, K. S. Tikhonov, and A. D. Mirlin, Multifractality of Wave Functions on a Cayley Tree: From Root to Leaves *Physical Review B* 96.21, 214204 (2017). (Editor’s suggestion)

Schools, Conferences and Talks

- 2019 Tensor Network based approaches to Quantum Many Body Systems (TENSOR19), San Sebastian, Poster contribution
- 2021 Ergodicity Breaking and Anomalous Transport in Quantum Many-Body Systems (qutran21), Dresden, Poster contribution
- 2022 Invited talk at ISTA, Vienna
- 2022 Wave Localization & Many-Body Localization in Quantum Information (waveloc22), Cargese, Poster contribution
- 2022 Non-Equilibrium Emergence in Quantum Design, Ingelheim, Poster contribution
- 2023 APS March meeting, Las Vegas NV, Contributed talk
- 2023 Young Research Leaders Group Workshop: Recent advances in non-equilibrium and magnetic phenomena, Ingelheim, Invited talk
- 2023 Invited talk at KIT, Karlsruhe
- 2024 Invited talk at University of Maryland, College Park MD
- 2024 Non-equilibrium Many-body Physics Beyond the Floquet Paradigm (nembf24), Dresden