

Robin Schäfer

Dr. rer. nat.

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Research positions

- August 2025 **Postdoc**, *Helmholtz-Zentrum Berlin*
– current ○ Department Theory of Novel Quantum Materials led Johannes Reuther
- March 2023 **Postdoctoral Associate**, *Boston University*
– July 2025 ○ Working in the Quantum Condensed Matter Physics division with Anushya Chandran, Christopher Laumann, Anatoli Polkovnikov, and Claudio Chamon

Doctoral studies

- Nov. 2018 **Dr. rer. nat.**, *Max Planck Institute for the Physics of Complex Systems*
– Dec. 2022 ○ Dissertation: **Magnetic frustration in three dimensions – summa cum laude**
○ Supervised by: David J. Luitz and Roderich Moessner
○ **Otto Hahn medal** awarded by the Max Planck Society for outstanding achievements
○ **Best Doctoral Thesis** within CRC-1143 (Correlated Magnetism: From Frustration to Topology) in 2023
○ Student of the International Max Planck Research Schools
○ Postdoctoral researcher from Jan. 2023 – Feb. 2023

Education

- Sep. 2016 **M.Sc. Physics**, *TU Dortmund*
– Aug. 2018 ○ **Grade: 1.0** (Range: 1.0 - 4.0); GPA equivalent: 4.0
— **graduated as best student of the year** —
○ *Thesis: Floquet time crystals and periodically driven quantum state transfer*
○ Supervised by: Joachim Stolze and Götz S. Uhrig
- Sep. 2016 **M.Sc. Mathematics**, *TU Dortmund*
– April 2019 ○ **Grade: 1.4** (Range: 1.0 - 4.0); GPA equivalent: 3.7
○ *Thesis: Density functional theory on unbounded domains*
○ Supervised by: Christian Meyer
- Sep. 2016 **Exchange student**, *Korea Advanced Institute of Science and Technology (KAIST)*
– June 2017 ○ GPA: 3.83/4.3
- Oct. 2013 **B.Sc. Physics**, *TU Dortmund*
– Aug. 2016 ○ **Grade: 1.3** (Range: 1.0 - 4.0); GPA equivalent: 3.7
○ *Thesis: Dynamics of wave packets in a magnetic field*
○ Supervised by: Joachim Stolze
- Oct. 2013 **B.Sc. Mathematics**, *TU Dortmund*
– Aug. 2016 ○ **Grade: 1.6** (Range: 1.0 - 4.0); GPA equivalent: 3.7
○ *Thesis: Operator splitting of the heat equation in cylindrical coordinates*
○ Supervised by: Stefan Turek

Distinctions and scholarships

- August 2024 **Distinction**, Thesis award by the CRC-1143 "Correlated Magnetism: From Frustration to Topology"
- June 2024 **Distinction**, **Otto Hahn medal** awarded by the Max Planck Society for outstanding scientific achievements during the Ph.D.
- June 2022 **Distinction**, Poster award at the HFM2022 conference in Paris
- Aug. 2018 **Distinction**, Best student of the year in M.Sc. Physics
- Sep. 2016 **Scholarship**, Funded by the German Academic Exchange Service (DAAD) for the student exchange at KAIST
- Oct. 2015 **Scholarship**, Funded by the German government and the Alumni club of the Physics Department PeP et al. e.V. at TU Dortmund
- Oct. 2014 **Scholarship**, Funded by the German government and the Alumni club of the Physics Department PeP et al. e.V. at TU Dortmund

Dissertation

R. Schäfer

Magnetic frustration in three dimensions

[Dissertation published via TU Dresden \(2022\)](#)

Publication list

- [13] E. M. Smith, **R. Schäfer**, et al.
Single Crystal Diffuse Neutron Scattering Study of the Dipole-Octupole Quantum Spin Ice Candidate $\text{Ce}_2\text{Zr}_2\text{O}_7$: No Apparent Octupolar Correlations Above $T=0.05\text{K}$
[Phys. Rev. X 15, 021033 \(2025\)](#)
- [12] **R. Schäfer**, and D. J. Luitz
DanceQ: High-performance library for number conserving bases
[SciPost Phys. Codebases 48 \(2025\)](#)
[DanceQ repository](#) and [DanceQ documentation](#)
- [11] Z. Lu, **R. Schäfer**, J. N. Hallén, C. R. Laumann
[111]-strained spin ice: Localization of thermodynamically deconfined monopoles
[Phys. Rev. B 110, 184421 \(2024\)](#)
- [10] D. Yahne, B. Placke, **R. Schäfer**, et al.
Dipolar spin ice regime proximate to an all-in-all-out Néel ground state in the dipolar-octupolar pyrochlore $\text{Ce}_2\text{Sn}_2\text{O}_7$
[Phys. Rev. X 14, 011005 \(2024\)](#)

- [9] J. Beare, E. M. Smith, J. Dudemaine, **R. Schäfer**, *et al.*
 μ SR Study of the Dipole-Octupole Quantum Spin Ice Candidate $\text{Ce}_2\text{Zr}_2\text{O}_7$
[Phys. Rev. B 108, 174411 \(2023\)](#)
- [8] E. M. Smith, J. Dudemaine, B. Placke, **R. Schäfer**, *et al.*
Quantum Spin Ice Response to a Magnetic Field in the Dipole-Octupole Pyrochlore $\text{Ce}_2\text{Zr}_2\text{O}_7$
[Phys. Rev. B 108, 054438 \(2023\)](#)
- [7] **R. Schäfer**, B. Placke, O. Benton, and R. Moessner
Abundance of hard-hexagon crystals in the quantum pyrochlore antiferromagnet
[Phys. Rev. Lett. 131, 096702 \(2023\)](#)
- [6] **R. Schäfer**, J. C. Budich, and D. J. Luitz
Symmetry protected exceptional points of interacting fermions
[Phys. Rev. Research 4, 033181 \(2022\)](#)
- [5] I. Hagymási, **R. Schäfer**, R. Moessner, and D. J. Luitz
Magnetization process and ordering of the $S = 1/2$ pyrochlore Heisenberg antiferromagnet in a magnetic field
[Phys. Rev. B 106, L060411 \(2022\)](#)
- [4] E. Smith, O. Benton, D. Yahne, B. Placke, **R. Schäfer**, *et al.*
The case for a $U(1)\pi$ Quantum Spin Liquid Ground State in the Dipole-Octupole Pyrochlore $\text{Ce}_2\text{Zr}_2\text{O}_7$
[Phys. Rev. X 12, 021015 \(2022\)](#)
— **Featured in** [Quantum Science and Technology Collection](#)
- [3] I. Hagymási, **R. Schäfer**, R. Moessner, and D. J. Luitz
Possible Inversion Symmetry Breaking in the $S = 1/2$ Pyrochlore Heisenberg Magnet
[Phys. Rev. Lett. 126, 117204 \(2021\)](#)
- [2] **R. Schäfer**, I. Hagymási, R. Moessner, and D. J. Luitz
Pyrochlore $S = \frac{1}{2}$ Heisenberg antiferromagnet at finite temperature
[Phys. Rev. B 102, 054408 \(2020\)](#)
- [1] **R. Schäfer**, G. S. Uhrig, and J. Stolze
Time-crystalline behavior in an engineered spin chain
[Phys. Rev. B 100, 184301 \(2019\)](#)

Preprints

- [1] E. M. Smith, A. Fitterman, **R. Schäfer**, *et al.*
Two-Peak Heat Capacity Accounts for $R \ln(2)$ Entropy and Ground State Access in the Dipole-Octupole Pyrochlore $\text{Ce}_2\text{Hf}_2\text{O}_7$
[arXiv:2501.08327 \(2025\)](#) — accepted in PRL (Editor's Suggestion)
- [2] D. Vuina, **R. Schäfer**, D. M. Long, A. Chandran
Probing Hilbert space fragmentation using controlled dephasing
[arXiv:2506.13856 \(2025\)](#)
- [3] **R. Schäfer**, C. Chamon, C. R. Laumann
Hall-on-Toric: Descendant Laughlin state in the chiral \mathbb{Z}_p toric code
[arXiv:2507.02035 \(2025\)](#)
- [4] H. Kim, **R. Schäfer**, D. M. Long, A. Polkovnikov, A. Chandran
— **shared first authorship**
Confined and deconfined chaos in classical spin systems
[arXiv:2507.07168 \(2025\)](#)

Software libraries

- [1] **DanceQ**: [Repository](#), [Documentation](#)

Media

- [1] Article in [Quantum Zeitgeist](#), July 2025.