



As a member of the Helmholtz Association, Forschungszentrum Jülich makes an effective contribution to solving major challenges facing society in the fields of information, energy, and bioeconomy. It focuses on varied tasks in the area of research management and utilizes large, often unique, scientific infrastructure. Come and work with around 6,400 colleagues across a range of topics and disciplines at one of Europe's largest research centres.

The Peter Grünberg Institute for Quantum Control (PGI-8) at the Forschungszentrum Jülich specializes in novel optimization strategies for emerging quantum technologies. The institute has pioneered the application of quantum optimal control methods to quantum computation and to many-body quantum systems. This includes development of physical models and model reduction techniques as well as algorithmic advances of in-situ optimization and machine learning to tackle the complex processes inherent to scalable quantum devices.

The Synthetic Quantum Matter group at PGI-8 aims, with its theoretical and numerical studies, at the possibility of shaping interesting many-body phenomena in fully controlled “analogue” systems (often called “quantum simulators”) even beyond the traditional limitations of condensed matter physics. Quantum optical tools (especially on ultracold gases) and the interplay of synthetic gauge fields with geometrical constraints and interactions, in order to achieve and manipulate (fractional) topological states of matter, and study their transport properties, are at the focus of the research activity. A central pillar sustaining this activity is represented by numerical methods managing quantum entanglement in a practical way, namely Tensor Networks.

The Peter Grünberg Institute for Quantum Control (PGI-8) is offering a

PhD Position - Synthetic Quantum Matter

Your Job:

- Using and further developing existing tensor network libraries and algorithms, possibly enriching them with tools coming from the machine learning community
- Designing quantum-optical experimental schemes for synthetic quantum matter platforms (e.g., engineering of interesting states, conceiving of observables suitable for their detection, ...)
- Investigating phases of matter where entanglement plays a key role, making them amenable to constitute the basis for developing quantum technologies
- Interfacing these research lines with the quantum optimal control activity of the

The job will be advertised until the position has been successfully filled. You should therefore submit your application as soon as possible. We look forward to receiving your application via our

Online-Recruitment-System!

Questions about the vacancy?

Get in touch with us by using **our contact form**.

Please note that for technical reasons we cannot accept applications via email.

www.fz-juelich.de

PGI-8 institute

- Regularly interacting with experimentalist partners to get into a constructive feedback loop

Your Profile:

- A successful completion of studies in theoretical physics (Master degree or its equivalent) is required.
- A solid background in some of the following fields is wished: (1) tensor networks, (2) many-body lattice systems, (3) atomic-molecular-optics systems, (4) topological matter, (5) entanglement in condensed-matter systems.
- A strong interest in developing analytical models and numerical optimization methods, and/or interest in working closely with experiments.
- Programming experience is desirable.
- Fluent command of written and spoken English
- Strong dedication and good communication skills are crucial criteria.
- Ability to work autonomously in close interaction within a team, with the right amount of enthusiasm to develop and follow your own ideas

Our Offer:

- Outstanding computing facilities at one of the largest computational centers in Germany.
- A highly motivated working group as part of an international and interdisciplinary working environment at one of Europe's largest research establishments.
- Continuous scientific mentoring by your scientific advisor, as well as an early exposure to international collaborations and conferences.
- Participation in overarching seminars including certificate.
- Dr. rer. Nat. / PhD dissertation at the University of Cologne, and membership to the JuDocs graduate center at Jülich and the Bonn-Cologne Graduate School, with all their offers.
- A training in quantum technologies, a field which currently faces (for the next decade at least) significant investment from private and governmental funding agencies.
- Pay in line with 50 % of pay group 13 of the Collective Agreement for the Public Service (TVöD-Bund). A payment of 75% may be possible upon skills.
- Information on employment as a PhD student at Forschungszentrum Jülich can be found here http://www.fz-juelich.de/gp/Careers_Docs

Forschungszentrum Jülich promotes equal opportunities and diversity in its employment relations.

We also welcome applications from disabled persons.