

Saarland University is a campus university that is internationally recognized for its strong research programmes. Fostering young academic talent and creating ideal conditions for teaching and research are a core part of the university's mission. As part of the University of the Greater Region, Saarland University enables students and staff to share and exchange knowledge and ideas between disciplines, between universities and across borders. With over 17,000 national and international students, studying more than a hundred different academic disciplines, Saarland University is a diverse and dynamic learning environment. [Saarland University is officially recognized as one of Germany's family-friendly higher-education institutions and with a combined workforce of more than 4,000 it is one of the largest employers in the region.]

The **Center for Quantum Technologies (QuTe) at Saarland University** is inviting applications for the following position commencing at the earliest opportunity.

PhD Position in Mathematical and Theoretical Quantum Physics (m/f/d)

Reference number W2953, salary in accordance with the German TV-L salary scale[1], pay grade: E13 TV- L, duration of employment: 3 years, volume of employment: 75 % of standard working time.

Workplace/Department:

At Saarland University, a new Center for Quantum Technologies (QuTe) has been founded in 2025. This center pursues research on quantum technologies in a broad sense, on the „hardware" side (in quantum physics, quantum optics and quantum engineering) as well as on the „software" side (in quantum information, theoretical physics / computer science / mathematics and quantum computing). It is truly interdisciplinary at the interface of Physics, Systems Engineering, Computer Science, and Mathematics. It will include an outpost of the Forschungszentrum Jülich with which it will closely collaborate.

We are looking for a curious and highly motivated PhD candidate to join the Mathematical Methods Group, led by Dr. David Edward Bruschi at Saarland University. The group is associated with the Center for Quantum Technologies (QuTe) and closely connected to the Institute for Quantum Computing Analytics (PGI-12) at Forschungszentrum Jülich.

The Group's research lies at the intersection of mathematical and theoretical physics, with a particular focus on Lie-algebraic approaches to quantum dynamics. The Group aims to develop rigorous mathematical methods to characterize and control the dynamics of bosonic and hybrid quantum systems, with potential applications in quantum computing and quantum control.

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[1] TV-L = collective agreement on remuneration of public sector employees in the German *Länder*

The pay grade assigned to an employee depends on their professional qualifications and the number of years of service. Each pay grade is further subdivided into levels. Entry-level employees with no previous experience will initially be assigned a level 1 rating. After one year at level 1 of the E10 pay grade, an employee will move up to level 2. After a further two years, the employee will move to level 3, etc.

Job requirements and responsibilities:

The PhD project focuses on Lie-algebraic approaches to quantum dynamics, with the overarching goal of formally and exactly characterizing the dynamics of bosonic and hybrid bosonic/finite-dimensional systems.
Building on recent theoretical developments by Dr. Bruschi and collaborators, the project addresses two main research questions:

- The role of symmetries in determining the constraints for full control of bosonic quantum dynamics.
- How to control the errors introduced by approximating and truncating the evolution operator when the dynamical Lie algebra is infinite-dimensional.

At later stages, the project will explore applications to systems of current importance, including continuous-variable (CV) quantum-optical and condensed-matter systems, connecting formal mathematical results with concrete implementations in quantum computing and control.
The successful candidate should enjoy rigorous mathematical analysis and be comfortable with formal, pen-and-paper theoretical work.

Your academic qualifications:

- Completed scientific university studies in physics, mathematics, or a closely related discipline.
- Language skills (according to GER): English – C1/C2

The successful candidate will also be expected to:

- Have a strong foundation in quantum mechanics and advanced calculus.
- Be comfortable with rigorous mathematical analysis and formal, pen-and-paper theoretical work.
- Ideally, have prior knowledge of Lie groups and Lie algebras, as well as differential geometry.

What we can offer you:

- A flexible work schedule allowing you to balance work and family, among other things the possibility of teleworking
- Secure and future-oriented employment with attractive conditions
- A broad range of further education and professional development programmes (for example language courses)
- An occupational health management model with numerous attractive options, such as our university sports programme
- Supplementary pension scheme (RZVK)
- Discounted tickets on local public transport services ('Job-Ticket' of the saarVV)
- Job bike leasing (JobRad)

We look forward to receiving your **meaningful online application** (in a PDF file) by **10. January 2027** to **qute@uni-saarland.de**. Please include the reference number **W2953** in the subject line of the e-mail.

If you have any **questions**, please contact us for assistance. Your contact:
Herr Dr. David Edward Bruschi
Mathematical Methods Group
Tel.: d.e.bruschi@fz-juelich.de

Pay grade classification is based on the particular details of the position held and the extent to which the applicant meets the requirements of the pay grade within the TV-L salary scale. Part-time employment is generally possible.

If you have obtained a foreign university degree, a proof of the equivalence of this degree with a German degree by the Zentralstelle für ausländisches Bildungswesen (ZAB) is needed before hiring. If necessary, please apply for this in time. You can find more information at https://www.kmk.org/zeugnisbewertung.

Unfortunately, neither costs for attending an interview at Saarland University nor costs for any certificate evaluation by the ZAB can be reimbursed in principle.

We welcome applications regardless of gender, nationality, ethnic and social origin, religion/belief, disability, age, and sexual orientation and identity. In accordance with its policy of increasing the proportion of women, the University actively encourages applications from women. Applications from severely disabled persons will be given preferential consideration in the event of equal suitability.

When you submit a job application to Saarland University you will be transmitting personal data. Please refer to our privacy notice for information on how we collect and process personal data in accordance with Art. 13 of the Datenschutz-Grundverordnung. By submitting your application you confirm that you have taken note of the information in the Saarland University privacy notice.