



Shaping change: this is what drives us at Forschungszentrum Jülich. As a member of the Helmholtz Association with some 7,600 employees, we conduct interdisciplinary research into a digitalized society, a climate-friendly energy system, and a sustainable economy. We focus on the natural, life, and engineering sciences in the fields of information, energy, and bioeconomy. We combine this with expertise in high-performance computing and artificial intelligence using unique scientific infrastructures.

The JARA-Institute for Quantum Information (JARA-QI), headed by David DiVincenzo and Hendrik Bluhm conducts theoretical research on many aspects of quantum computing and experimental research on semiconductor qubits. The institute has two parts, located at the sites Forschungszentrum Jülich GmbH and RWTH Aachen University, under the umbrella of the Jülich-Aachen Research Alliance (JARA). In the domain of semiconductor qubits, the development and validation of an advanced architecture based on coherent long range qubit shuttling is currently one of our main activities. To this end, we pursue a holistic approach addressing material challenges, device simulation, fabrication, systematic characterization, high fidelity operation as well as integration and scaling technologies. Our ultimate vision is a fully integrated semiconductor processor with integrated low-power control circuits to enable a scale up to millions of qubits.

<https://www.youtube.com/watch?v=0tWapIC4FVs>

We are looking to recruit a

Postdoc in the domain of coherent spin shuttling for scaling semiconductor qubits

Your Job:

Building on in-house fabricated devices, we have recently demonstrated the ability to shuttle electrons between gate defined quantum dots in Si/SiGe over micron-scale distances using only four different AC-voltages, independent of the distance covered <https://arxiv.org/abs/2108.00879>. Theoretical consideration indicate good prospects for maintaining spin-coherence of the shuttled electron, which would make this approach very promising for scaling up semiconductor spin qubit devices. This position focuses on experimentally demonstrating coherent spin shuttling, shuttling-compatible high-fidelity qubit control and further ingredients for a shuttling-based architecture, using devices from academic or industrial fabrication.

Key activities can include:

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

- Demonstration and experimental characterization of spin coherence during shuttling
- Shuttling-compatible demonstration of high-fidelity qubit control
- Demonstration of T-Junctions (Fig. 1(b)) as step towards qubit grids
- Advancement of a shuttling based architecture with 2D-connectivity
- Migration to industrially fabricated devices

Your Profile:

- Master and PhD in physics or a related field
- In-depth experience with quantum control experiments on quantum dot qubits
- Good software development skills
- Experience with sub-Kelvin cryogenic techniques
- Strong aptitude for mentoring students
- Good communication skills
- A strong drive to conduct ambitious, cutting edge research towards scalable quantum computing
- A research track record commensurate with our ambition

Our Offer:

We work on the very latest issues that impact our society and are offering you the chance to actively help in shaping the change! We support you in your work with:

- A large research campus with green spaces, offering the best possible means for networking with colleagues and pursuing sports alongside work
- Comprehensive training courses and individual opportunities for personal and professional further development
- Extensive company health management
- Ideal conditions for balancing work and private life, as well as a family-friendly corporate policy
- Flexible work (location) arrangements, e.g. remote work
- Targeted services for international employees, e.g. through our International Advisory Service

In addition to exciting tasks and a collaborative working atmosphere at Jülich, we have a lot more to offer: <https://go.fzj.de/benefits>

We offer you an exciting and varied role in an international and interdisciplinary working environment. The position is for a fixed term of 2 years, with possible long-term prospects. Salary and social benefits will conform to the provisions of the Collective Agreement for the Public Service (TVöD-Bund), pay group 13-14, depending on the applicant's qualifications and the precise nature of the tasks assigned to them.

We welcome applications from people with diverse backgrounds, e.g. in terms of age, gender, disability, sexual orientation / identity, and social, ethnic and religious origin. A diverse and inclusive working environment with equal opportunities in which everyone can realize their potential is important to us.