

Spin Qubits in Silicon

SPIN

National Centre of Competence in Research

Brief overview

The laws of physics tell us that quantum computers are the most powerful computers imaginable. Unlike classical computers, whose smallest storage unit is the bit, quantum computers operate according to quantum mechanics and consist of quantum bits, or qubits. Unlike the classic binary bit, qubits can contain multiple states simultaneously, and so have the potential to massively increase computing power and speed. This means that quantum computers are vastly more powerful than the classical computer in many cases: they can solve mathematical problems or solve processes which are beyond the capability of classical computers. Despite some success in recent years, building a functioning and efficiently operating quantum computer remains a huge challenge. Progress is required, in particular in terms of scalability, miniaturisation and error reduction.

The SPIN National Centre of Competence in Research (NCCR) aims to make a major contribution to research into and the development of quantum computers and create the basis for a new information-processing technology. The NCCR's objective is to develop small, fast, scalable silicon-based qubits. It will also generate important findings on software and algorithm development, error correction and the architecture of future quantum computers. The NCCR comprises an interdisciplinary team with research groups working in experimental and theoretical physics, material science, engineering and computer science. There will also be close cooperation with the industry-based research partner IBM Research, creating exceptional opportunities to develop prototypes and practically applicable technology. This could lay the foundations for accelerating the pace of digitalisation.

The NCCR is based at the University of Basel, where seven research groups operate. The national network includes IBM Research in Rüschlikon (six research groups), the ETH Zurich (four research groups) and the EPF Lausanne (two research groups).

Further informations

<https://spin.unibas.ch>

www.sbf.admin.ch/nccr-e

Facts and figures

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Federal funding: CHF 17m (2020–2023)

Home institution: University of Basel

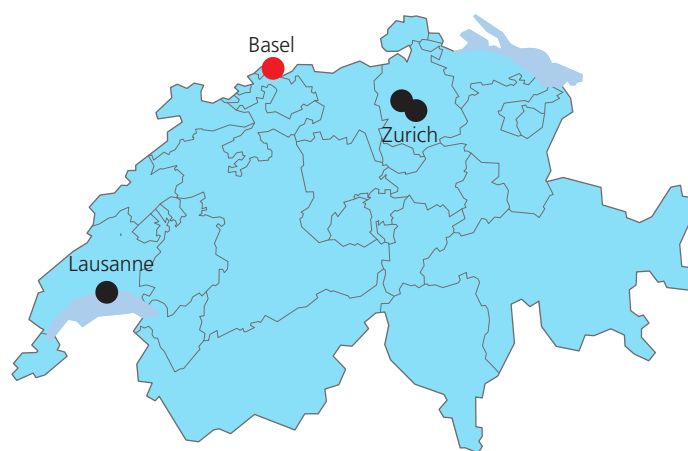
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University of Basel (7)

Network
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IBM Research (6)
ETH Zurich (4)
EPF Lausanne (2)