



Universität
Basel

Research Project

Scalable High Bandwidth Quantum Network (sQnet)

Third-party funded project

Project title Scalable High Bandwidth Quantum Network (sQnet)

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Organisation / Research unit

Departement Physik / Experimentelle Nanophysik (Treutlein)

Department

Departement Physik

Project start 01.09.2023

Probable end 31.08.2027

Status Active

Realizing a scalable quantum network is one of the grand challenges of quantum technology, with numerous potential applications in secure communication, quantum sensor networks, and distributed quantum computation. Single-photon sources and compatible quantum memories are key ingredients of quantum networks and the requirements on their performance are very stringent.

In this project we will establish a scalable quantum networking platform that combines several high-performance elements: semiconductor quantum dot single-photon sources and compatible atomic vapor cell quantum memories implemented in scalable MEMS technology, operating with GHz bandwidth at convenient near-infrared wavelengths. Connectivity over long distance and to other platforms is enabled by efficient conversion of single photons to telecom wavelength using on-chip nonlinear optics. Combining these building blocks, we will demonstrate quantum networking tasks such as remote entanglement generation between quantum memories over a telecom fiber link. By demonstrating the basic functionality of a scalable quantum networking platform that operates at high efficiency and bandwidth, the project will lay the ground for the implementation of more advanced quantum networking protocols and scaling to multiple nodes.

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