Master project

The development of optically-active gate-defined quantum dot

Background

This project is motivated by realizing a quantum network consisting of multiple "quantum nodes" entangled via "quantum channels". Such network (see example in Figure 1) could become the basis of quantum Internet or quantum communication system. The aim of this project is to develop a new type of optically-active gate-defined quantum dot acting as an interference between flying photonic qubits and stationary spin qubits.

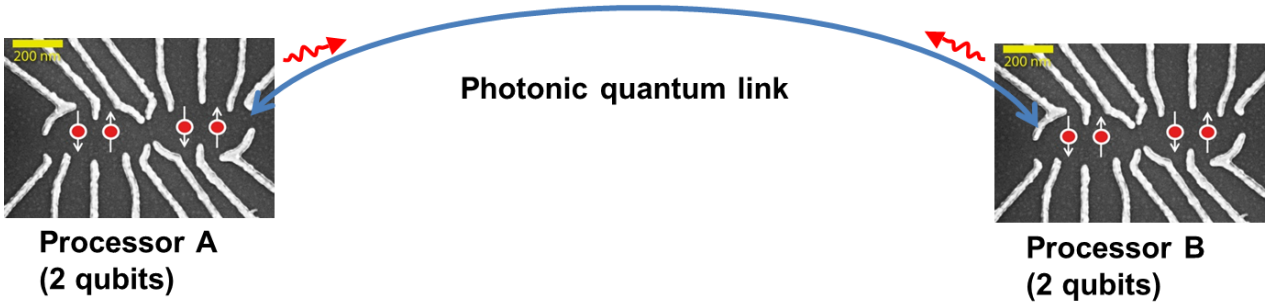

Figure 1. Proof of principle quantum network based on semiconductor spin qubits. This minimal quantum network consists of two quantum processors (quantum nodes) with two spin qubits. The two quantum processors can be entangled by converting the spin qubits to photonic qubits and performing quantum interference between the photonic qubits from the two processors.

Your task

The master student will be involved in building a 4 K optical setup and conduct a systematic characterization of the optically-active gate-defined quantum dot by performing quantum optical/transport experiments at cryogenic temperature (4.2 K). This project also involves in programming in Python. The successful completion of this project will provide the student a strong basis for his/her future PhD project. Depending on the start date, the student may have the opportunity to conduct experiments both in Forschungszentrum Jülich and RWTH Aachen. Due to the we are patenting the the OAGDQD, we cannot show the data we already obtained. For more details, please contact Dr. Feng Liu, office: Physikzentrum 26A 303, Feng.Liu@physik.rwth-aachen.de, or Prof. Hendrik Bluhm, office: Physikzentrum 26A 303, 28 C 309, bluhm@physik.rwth-aachen.de.