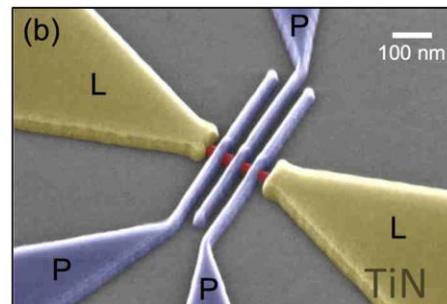


Scientific Area	Quantum Electronics
Topic title	Gate-based sensing of spin qubits
Main host institution	IBM research - Zurich www.zurich.ibm.com
Supervisor/institution	Gian Salis www.zurich.ibm.com/st/quantum/alternativeplatforms.html
Co-Supervisor/institution	Richard Warburton, University Basel www.nano-photonics.unibas.ch
Mentor¹/institution	To be determined
Secondment institution	University of Basel www.unibas.com
Topic description	
<p>Spin qubits realized in gate-defined silicon quantum dots demonstrate excellent coherence and very long decay times. Because of their small size and the availability of rapid two-qubit gates, spin qubits are considered as a platform that can be scaled to many qubits. One of the challenges is to perform a fast and high-fidelity read-out of the spin state of the qubits. Typically, a separate charge sensor is needed that can be quickly read-out using dispersive read-out techniques. In a scalable architecture, it is preferred to avoid the overhead of the charge sensor and use reflectometry of a resonator circuit in the microwave frequency range that is directly connected to the gate electrode of the quantum dot itself [1,2].</p> <p>In this project, we will investigate gate-based dispersive sensing of spin qubits using microwave resonators integrated on the silicon substrate [3]. Quantum dots and microwave resonators will be designed and fabricated in our BRNC cleanroom. Microwave and DC measurements will be performed in dedicated dilution refrigerators. The goal is to establish single-shot measurements of spin qubits in a scalable architecture using small-footprint microwave resonators.</p> <p>[1] A. West <i>et al.</i>, Nat. Nanotechnol. 14, 437 (2019). [2] M. Urdampilleta <i>et al.</i>, Nat. Nanotechnol. 14, 737 (2019). [3] G. Zheng <i>et al.</i>, Nat. Nanotechnol. 14, 742 (2019).</p>	
Recommended applicant's profile	
<p>We are looking for a highly motivated physicist with an outstanding proficiency in quantum physics and semiconductor physics. The candidate should be interested in experimental work and be driven by the desire to develop analytical and numerical models to understand the measured data. Good programming skills preferentially in Python or matlab, experience with clean-room sample fabrication, RF measurement techniques and transport measurements in cryostats are desired.</p>	



¹ Mentor: The primary role of the mentors will be to identify and facilitate specific training objectives, advise on any problems faced by the ESR, including career matters with an external perspective and provide mediation in the case of disputes.