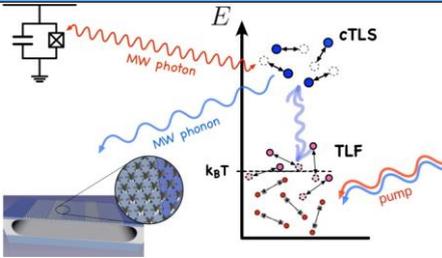


Scientific Area	SA1 Quantum Electronics
Topic title	Charge noise and coherence of hole spins in group-IV QD devices.
Main host institution	IBM Research – Zurich https://www.zurich.ibm.com
Supervisor/institution	Andreas Fuhrer https://researcher.watson.ibm.com/researcher/view.php?person=zurich-afu
Co-Supervisor/institution	tbd
Mentor¹/institution	Richard Warburton / University of Basel
Secondment institution	University of Basel
Topic description	
<p>Fast electrical control of hole spins in group-IV quantum dots can be realized via the spin-orbit interaction. This is a promising alternative to conventional spin-qubit control with microwave currents or electric fields in combination with micromagnets. Furthermore, specific nanowire geometries allow to control the strength of the spin-orbit interaction by application of a DC-electric field.</p>	
<p>In this project we will fabricate group-IV MOS quantum dots that allow us to study the effect of noise on confined hole spins. Noise sources are instrument noise on the one hand and material related microscopic noise sources on the other hand. The latter is typically described as a bath of two-level systems (TLSs) but their detailed microscopic origin is not really known. We will leverage the small size and tunable sensitivity of hole quantum dots to identify and localize these TLSs and work on schemes to avoid their creation during fabrication. In this regard we will test beam-less fabrication of the devices with e.g. thermal probe lithography, employ passivation schemes used in classical silicon technology and compare various materials (gate oxides) in terms of noise.</p>	
Recommended applicant's profile	
<p>The candidate should have a solid background in quantum mechanics, quantum information processing and surface/material science, ideally with some experience in quantum dot spin qubits or silicon device processing. The candidate must be curious to learn and expand her/his expertise on quantum circuit design, microwave engineering, material science, low-temperature physics, instrumentation, control and measurement automation, data analysis and coding. Good knowledge of Python and Jupyter is desired.</p>	

Field Code Changed

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.