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Internship opportunities in quantum sensing

The "Quantum Sensing Group" at the University of Basel is offering various opportunities for student internships for durations of several months, with possible starting dates in the beginning of 2015. The group's research is centered around the emerging field of "Quantum sensing", where we explore the use of individual, well-controlled quantum systems as high-performance sensing devices. We concentrate on implementing various types of such sensors and on applying them to outstanding scientific tasks in mesoscopic physics, nano-science and technology. Our quantum system of choice for these purposes is the Nitrogen-Vacancy (NV) color center in diamond, whose exceptional quantum-coherent properties allow for high-performance sensing applications even at room temperature.

The group currently has two main lines of activities, in both of which internships can be offered:

Hybrid spin-oscillator quantum systems: In this project, we investigate single-crystalline diamond nanomechanical resonators and the direct coupling of their oscillatory motion to spins in the diamond host material [1, 2]. The long term goal of the project is to establish a hybrid quantum-mechanical system, where a single electronic spin will be coherently coupled to quantum degrees of freedom of a (massive) mechanical resonator. Such devices will find applications in high precision metrology, as universal transducers between different quantum-mechanical systems and in fundamental studies of the quantum-behavior of massive objects [3].

Mesoscopic magnetic imaging and quantum sensing: We are exploiting single spins as highly sensitive detectors for magnetic fields on the nanoscale. In particular, in this project, we exploit individual, scannable spins for nanoscale imaging and sensing [4]. A main focus thereby lies on exploring nanoscale magnetic phenomena in mesoscopic, solid-state systems systems. Prime examples include the study of spin- and charge-transport in low-dimensional systems as well as the exploration of exotic magnetic phenomena in the solid state.

Next to these main activities, the group also has strong interests and expertise in diamond nanofabrication [5] as well as nanophotonics [6]. In all these projects, various possibilities for student internships exist and can be adapted to the particular interests of applicants. We are looking for candidates with high motivation to work on experimentally challenging projects and with strong interests in quantum physics, coherent single spin manipulation and quantum optics.

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