

8. November 2021

Einladung zum Physikalischen Kolloquium

12.11.2021 **Patrick Maletinsky, Universität Basel**

»Quantum sensing and imaging of magnetism on the nanoscale«

Einführung: D. Hunger

Quantum two-level systems offer attractive opportunities for sensing and imaging at the nanoscale. In the fifteen years since its inception, this idea [1] has advanced from proof of concept [2] to a mature quantum technology [3], which already finds applications in condensed matter physics, materials science and engineering. In this talk, I will present the key engineering challenges [4] we have addresses in this development and highlight particularly rewarding applications of single-spin, scanning probe microscopy.

Specifically, I will discuss how we employ single electronic spins in diamond for nanoscale probing of antiferromagnetic systems [5-9] and high-resolution imaging of atomically thin “van der Waals” magnets [10,11]. For both, the combination of sensitivity, spatial resolution and quantitative imaging enables unprecedented insights such as quantitative imaging of nanoscale domains [8] and domain-walls [9] in antiferromagnets and nanoscale imaging of spin textures in magnetic systems down to the atomic monolayer limit [11].

I will conclude with an outlook of future developments of single spin magnetometers for extreme conditions, such as high magnetic fields, millikelvin temperatures or for high-frequency sensors to probe the dynamics of nanomagnetic systems.

- [1] B. Chernobrod and G. Berman, J. of Applied Physics 97, 014903 (2004)
- [2] G. Balasubramanian et al., Nature 455, 644 (2008)
- [3] P. Appel et al., Review of Scientific Instruments 87, 063703 (2016)
- [4] N. Hedrich et al. Phys. Rev. App., 14, 064007 (2020)
- [5] T. Jungwirth et al., Nature Nanotechnology 11, 231 (2016)
- [6] T. Kosub et al., Nature Communications 8, 13985 (2017)
- [7] I. Gross et al., Nature 549, 252 (2017)
- [8] P. Appel et al., Nano Letters 19, 1682 (2019)
- [9] N. Hedrich et al., Nature Physics 17, 574 (2020)
- [10] M. Gibertini et al., Nature Nanotechnology 14, 408 (2019)
- [11] L. Thiel et al., Science 364, 973 (2019)

Der Vortrag findet um 16:00 Uhr im Otto-Lehmann-Hörsaal, Physik-Flachbau (Geb. 30.22), statt. Bitte beachten Sie, dass das Betreten des Hörsaals nur unter Einhaltung der „3G-Regel“ erlaubt ist.