O 102: Closing Talk Andreas Heinrich

Time: Friday 13:15–14:00 Location: H1

Topical Talk O 102.1 Fri 13:15 H1

Quantum sensing with atomic-scale spatial resolution — •Andreas Heinrich — IBS Center for Quantum Nanoscience, Seoul, Korea

There is a strong international research effort in the area of quantum nanoscience, where the concepts of quantum coherence, superposition and entanglement of quantum states are exploited in solid state and molecular systems. One of the very prominent applications in this realm is Quantum Sensing, where a quantum system is used to measure some external fields with high energy and high spatial resolution. In this talk we will focus on quantum-coherent experiments in Scanning Tunneling Microscopy (STM). STM enables the study of surfaces with atomic-scale spatial resolution and offers the ability to study individual atoms and molecules on surfaces. To make a movable quantum sensor with atomic-scale spatial resolution, we attached a single molecule of PTCDA to the spin-polarized apex of an STM tip. In contrast to all other known molecules, its coupling to the tip is so weak that this molecule performs as an excellent electron spin resonance (ESR) sensor on a bare metallic surface. We show how this sensor can be used to measure atomic-scale magnetic and electric fields emanating from single atoms on a surface and compare its performance to the well-established NV center in diamond.

Taner Esat, Dmitriy Borodin, et al., A quantum sensor for atomic-scale electric and magnetic fields, Nature Nanotechnology (2024).

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