SE-02-01

Quantum sensing and imaging with diamond spins

Ania Claire Bleszynski Jayich

UC Santa Barbara

Abstract

Solid state spin qubits, in particular the nitrogen vacancy (NV) center in diamond, offer a path towards truly nanoscale imaging of condensed matter and biological systems with sensitivity to single nuclear spins. Here I discuss our NV-based magnetic imaging experiments as applied to condensed matter systems, where we have imaged current flow patterns in graphene in order to reveal the transition from ohmic to electron-collision-dominated flow regimes. A grand challenge to improving the spatial resolution and magnetic sensitivity of the NV is mitigating surface-induced quantum decoherence, which I will discuss in the second part of this talk. Decoherence at interfaces is a universal problem that affects many quantum technologies, but the microscopic origins are as yet unclear. Our studies guide the ongoing development of quantum control and materials control, pushing towards the ultimate goal of NV-based single nuclear spin imaging.