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JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Seminar über Quanten-, Atom- und Neutronenphysik (QUANTUM)

Jan. 30, 2025 at 2:15 p.m.
IPH Lorentzraum 05-127

Prof. Dr. Dominik Bucher
Technische Universität München

Optical widefield magnetic resonance microscopy

In my talk, I will present a novel approach to magnetic resonance microscopy that exploits nitrogen-vacancy (NV) centers in diamond for optically detected magnetic resonance (ODMR). The fusion of optical microscopy and nuclear magnetic resonance (NMR) spectroscopy bypasses the conventional reliance on k-space sampling and magnetic field gradients for spatial encoding of NMR signals, enabling real-space magnetic resonance imaging (MRI).

We demonstrate the capabilities of our widefield optical NMR microscopy technique by imaging NMR signals within a model microstructure, achieving a spatial resolution of approximately 10 µm over an area of ~235 × 150 µm². Each camera pixel captures a complete NMR spectrum, providing comprehensive information on signal amplitude, phase, local magnetic field strengths, and gradients. The integration of optical microscopy and NMR opens up new possibilities for a wide range of applications in the physical and life sciences, which I will discuss in the last part of my talk. These applications include imaging metabolic activity in single cells or tissue slices, analyzing battery materials, and facilitating high-throughput NMR analysis.

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