Dresden University of Technology

Faculty of Physics

PHYSICS COLLOQUIUM

Speaker:

Prof. Aparajita Singha
Institut für Festkörper-& Materialphysik and ct.qmat,
Technische Universität Dresden

Topic:

From Defects to Sensors: Nanoscale Magnetometry with Diamond
– Inaugural lecture

Time and place:

Tuesday, January 13, 2026, **2:50 pm** – hybrid event
The colloquium will be held in REC/C213.
Online participation possible:
Zoom-Meeting: Meeting-ID: 631 3817 8900 / passcode: PC-WiSe25
https://tu-dresden.zoom-x.de/j/63138178900?pwd=TlmGawPz1dtDA6VzO2N1XdqqI7bE6b.1

Host:

Vice-dean of the Faculty of Physics Prof. Jochen Geck

Abstract:

Solid-state spin defects such as nitrogen-vacancy (NV) centers in diamond, have emerged as powerful platforms for quantum sensing, enabling nanoscale measurements of magnetic fields, temperature, strain, and electric fields at both cryogenic temperatures as well as at ambient conditions. My research group focusses on utilizing these quantum sensors for non-invasive probing of isolated magnetic molecules on surfaces, which are difficult to access using other complementary techniques. These efforts naturally require the usage of near surface NV centers (< 10 nm) to gain desired magnetic sensitivity. However, such shallow NV sensors are also infamous for often lacking sufficient stability of their optical and spin properties. We take advantage of our UHV experimental conditions to understand the role of the diamond surface in defining these optical and spin properties for shallow NV sensors, as well as to better engineer the diamond surface with desired surface-chemistry. Another aspect of our current research involves two-dimensional mapping of both static and dynamic magnetization profile of synthetic antiferromagnets, as well as nanoscale devices, using scanning probe NV magnetometer. The key idea here is to identify their local nanoscale properties which are often obscured in conventional transport measurements. After introducing the essential concepts of nanoscale quantum sensing and providing a broad overview of the current research scopes in my experimental group, I will also highlight on the current challenges and the opportunities in this vibrant field of research.

Bio:

Prof. Dr. Aparajita Singha joined TU Dresden in January 2025 as Chair of Nanoscale Quantum Materials. She received her doctorate from EPFL, Switzerland in 2017 and then pursued

postdoctoral research on atomic-scale electron spin resonance at the IBS Center for Quantum Nanoscience in Seoul from 2018--2019. In 2020, she joined the Max Planck Institute for Solid State Research in Stuttgart as a group leader. Following the award of the DFG Emmy Noether grant in 2022, she established an independent research group, which is now transferred to TU Dresden upon her appointment.