TECHNISCHE UNIVERSITÄT
IN DER KULTURHAUPTSTADT EUROPAS
CHEMNITZ

Physikalisches Kolloquium gemeinsam mit dem SFB HYP*MOL

Donnerstag, 02. Juli 2026, 15:30 Uhr

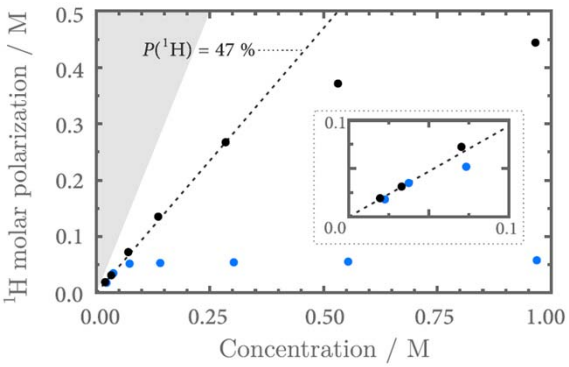
Ort: Reichenhainer Str. 90;
Zentrales Hörsaal- und Seminargebäude, Raum C10.013

Prof. Dr. Martin B. Plenio
Universität Ulm

Quantum control for hyperpolarized NMR

Nuclear Magnetic Resonance (NMR), a widely employed spectroscopic technique in biology and the life sciences, finds diverse applications ranging from chemical analysis and drug discovery to medical imaging. Despite its versatility, NMR faces inherent limitations, primarily linked to its low sensitivity. This constraint stems from the weak nuclear spin polarization in thermal equilibrium, typically amounting to a few parts per million, coupled with the inefficiencies inherent to inductive NMR signal detection.

I will explore strategies to overcome these limitations through the application of quantum technologies. Specifically, I will showcase how optically detected magnetic resonance, utilising color centers in diamond, provides a means for detecting NMR signals with chemical shift resolution at the nano- and microscale. However, achieving this goal requires additional considerations, and I will discuss how quantum control can facilitate nuclear spin hyperpolarization, resulting in 10,000-fold increases in NMR signals. Combined with signal processing methods, this approach holds the potential not only for metabolic NMR-profiling of single cells but also for metabolic magentic resonance imaging in humans, with potential applications in early treatment assessment in cancer care using standard clinical MRI Scanners.



[1] S. Schmitt et al, Science **356**, 832 (2017); I. Schwartz, et al, Sci. Rep. **9**, 6938 (2019)
[2] L. Dagys et al, Science Advances **10**, eado0373 (2024)
[3] B.A. Rodin et al. Robust hyperpolarization of small molecules through intermolecular transfer of parahydrogen-derived polarization. Submitted 2026

Information zum Vortrag erteilt:
Prof. Dr. Georgeta Salvan, Tel.: 531 33137
Alle Zuhörer sind ab 15:15 Uhr zum Kaffee vor dem Hörsaal eingeladen.

HYP*MOL Sommerfest, ab 17 Uhr, Physik-Gebäude

www.tu-chemnitz.de/physik