universität innsbruck
Forschungsschwerpunkt Physik

Innsbruck Physics Colloquium

Molecular Nuclear-Spin Qudits: Implementation of Grover's Search Algorithm and First-time Observation of Optically-detected NMR

Colloquium talk
by

Mario Ruben

Karlsruhe Institute of Technology, Germany
University of Strasbourg, France

The nuclear spin degree of freedom in rare-earth molecules will be proposed to act as quantum registers for Quantum Computing (QC) and Quantum Communication (QComm). We report on the implementation of lanthanide metal complexes into nanometre-sized spintronic devices by a combination of bottom-up self-assembly and top-down lithography techniques. The controlled generation of magnetic molecular nanostructures will be shown and persistence of their magnetic properties under confinement will be confirmed. The Hilbert space spanned by the nuclear spins will be engineered synthetically and addressed both electrically and optically, partially at the single molecule level. Finally, Grover's quantum search algorithm will be implemented on the nuclear spin register of a $^{159}TbPc_2$ Qudit and the observation of OD-NMR in a $^{151}Eu(III)$ complex will be reported.

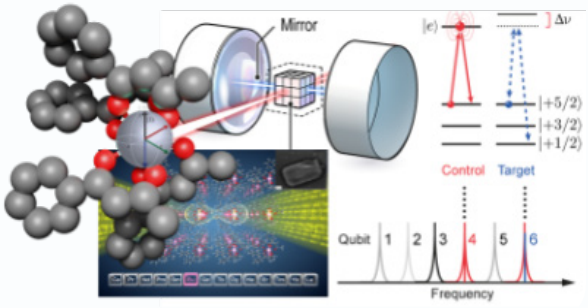

Image taken from M D. Serrano et al. Nature 2022, 603, 241.

Tuesday, 17 March, 16:30

HS C, Victor-Franz-Hess-Haus

Organizers: Katrin Erath-Dulitz, Francine Marleau, Hanns-Christoph Nägerl