



IFMP Seminar

Date Monday, May 27, 2024, at 14:50

REC/C213

BigBlueButton: <https://bbb.tu-dresden.de/b/dar-mbs-me8-gsc>

Speaker **Robin Gühne**
MPI-CPfS, Dresden

Title **Nuclear magnetic resonance of the charge-ordered kagome metal ScV_6Sn_6**

Abstract Covalent two-dimensional metals with triangular motifs and confined electronic states are a rich playground in modern solid-state physics. Among the non-magnetic materials, systems that are based on kagome layers attract increasing attention as they naturally feature Dirac cones, van-Hove singularities, and flat bands in their electronic band structure. Some kagome-based metals have recently been found to exhibit favorable properties, including unconventional superconductivity, charge density waves (CDW), switchable chiral transport, and signatures of an anomalous Hall effect (AHE). The vanadium-based kagome metal ScV_6Sn_6 undergoes a charge-density-wave transition around 96 K. The origin of this transition is still under debate, as well as the properties of the CDW phase, as related to chirality of the charge order or hidden magnetism. Nuclear magnetic resonance (NMR) is a versatile local technique with atomic resolution that provides a unique perspective on the electronic properties of a material. We use ^{51}V NMR to study the local properties of the CDW phase in single-crystalline ScV_6Sn_6 , aided by density functional theory (DFT) [1]. We trace the dynamics of the local magnetic field during the CDW phase transition and determine a loss in the density of states (DOS) in excellent agreement with DFT. The local charge symmetry of the V surroundings in the CDW phase reflects the commensurate modulation of the charge density with wave vector $q=(\frac{1}{3},\frac{1}{3},\frac{1}{3})$. An unusual orientation-dependent change in the NMR shift splitting symmetry, however, reveals orbital-selective modulations of the local DOS. In my talk I will introduce the method of single-crystal NMR of complex quantum matter in the presence of CDWs, and will give an overview of our recent findings in ScV_6Sn_6 .

[1] Guehne, R., Noky, J., Yi, C., Shekhar, C., Vergniory, M. G., Baenitz, M., & Felser, C., *Orbital selective commensurate modulations of the local density of states in ScV_6Sn_6 probed by nuclear spins*. [arXiv:2404.18597](https://arxiv.org/abs/2404.18597).

Host: E. Hassinger