Physikalisches Kolloquium

Christian Rüegg, University of Geneva & Paul Scherrer Institut Villigen
»Division Research with Neutrons and Muons«

Einführung: M. Le Tacon

Materials made of arrays of quantum spins forming well-defined lattices serve as model systems to study the phases of correlated magnetic quantum matter like spin Luttinger-liquids, magnon Bose-Einstein condensates, or spin supersolids. Neutron and X-ray scattering are unique tools for high-precision studies of such phases and of their correlations and excitations with high energy and momentum resolution. We investigate elementary quasi-particles and their stability under static multi-extreme conditions in temperature, magnetic field and pressure in frustrated and low-dimensional magnets. In one-dimensional ladder systems with and without frustration, we control and observe single- and multi-particle excitations and their decay using fundamental symmetries [1,2]. In the two-dimensional frustrated Shastry-Sutherland lattice, pressure is used to control directly the frustration and stability of quasi-particles resulting in novel quantum phases near (deconfined) quantum critical points [3]. Recently we extended these studies to systems with strong spin-orbit and spin-lattice coupling [4,5]. The results will be discussed in the context of recent developments in computational physics and exciting new opportunities that free electron lasers will offer to study the time-dependence and out-of-equilibrium dynamics of such systems.

[1] S. Ward et al. Phys. Rev. Lett. 118, 177202 (2017).
[2] K. Plumb et al. Nature Physics 12, 224 (2016).
[3] M. Zayed et al., Nature Physics 13, 962 (2017).
[4] A. Biffin et al. Phys. Rev. Lett. 118, 067205 (2017).
[5] S. Toth et al. Nature Comm. 7, 13547 (2016).

Freitag, 15.12.2017, 15:45 Uhr,

KIT, Campus Süd,
Otto-Lehmann-Hörsaal, Physik-Flachbau (Geb. 30.22).
Anschließend Nachsitzung im Gastdozentenhaus „Heinrich Hertz“