SFB 608

Einladung zum Kolloquium

Ort: Universität zu Köln
II. Physikalisches Institut
Seminarraum 201

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Thema: Exotic Phases Flourish in Quantum Magnets at High Magnetic Fields

Advancements in the way high magnetic fields are produced in the laboratory have opened opportunities to study a new class of physical phenomena: *the physics of magnetic elemental excitations that are created and live in quantum paramagnets*. These excitations, called triplons, behave like neutral atoms that form condensates or electric charge-pairs that superconduct. While the thermodynamic phase transition that leads into these states has been studied in excruciating detail in liquid Helium, the quantum phase transition had to wait for longer since it is hard to change the chemical potential continuously in an atomic gas. In the case of triplons, instead, high magnetic fields can be used to induce a quantum phase transition by chemical potential, *i.e.* controlling the chemical potential in a reversible way at temperature near the absolute zero. In these conditions, when the host material is highly symmetric, the magnetic phase transition into a XY-AFM state is mathematically identical to a Bose-Einstein condensation. On the other hand, if the underlying crystal symmetry is complex the resulting magnetic frustration has dramatic effects and creates ideal conditions for the observation of dimensional reduction such as first observed in the ancient Chinese pigment $BaCuSi_2O_6$, [1] strong spin-lattice correlations in $NiCl_2$-$4SC(NH_2)_2$ [2], and spiral magnetic phases in $Ba_3Mn_2O_8$ [3]. In my talk I will discuss recent experiment and modeling efforts conducted at NHMFL and LANL mostly by my collaborators Neil Harrison, Suchitra Sebastian, Eric Samulon, Vivien Zapf, Ian Fisher, Pinaki Sengupta, Cristian Batista, and several others.

[1] S.E. Sebastian et al.; Nature. **441** 617 (2006).
[2] V.S. Zapf et al., Physical Review B **77**, 020404 (2008)
[3] E.C. Samulon et al.; arXiv:0707.2075v1 [cond-mat.str-el]

Gez. J.A. Mydosh