IFMP Seminar

TECHNISCHE UNIVERSITÄT DRESDEN

IFMP — Institut für Festkörper- & Materialphysik

Date   Tuesday, May 11, 2021, at 14:50
BigBlueButton:
https://selfservice.zih.tu-dresden.de/l/link.php?m=101854&p=77af239f (TUD)
https://selfservice.zih.tu-dresden.de/link.php?m=101854&p=553e947d
(external)

Speaker   **Andrej Zorko**
Jožef Stefan Institute & University of Ljubljana

Title   **Chargeless Spinon Metal: From Spinon Pairing to Kondo Screening**

Abstract   Spinon metal is a fascinating state of matter found in certain charge insulators that features strong geometrical frustration of the underlying spin lattice. Contrary to more-common magnetically ordered states, it belongs to a class of states known as spin liquids, which are magnetically disordered, yet highly quantum entangled. In the case of the spinon metal, magnetic excitations from the spin-liquid ground state – spinons – form a Fermi surface and may, in a way, behave similarly as itinerant electrons behave in ordinary metals.

I will present the case of a spinon-metal state in the kagome-lattice antiferromagnet Zn-brochantite, $ZnCu_3(OH)_6SO_4$. Quite unexpectedly, our local-probe magnetic investigation has revealed that this state undergoes a magnetic-field-induced instability due to spinon pairing at low temperatures [1]. This is analogous to the formation of Cooper pairs in superconductors. Moreover, another phenomenon traditionally associated with itinerant electrons has been recently discovered in this material with frozen charge degrees of freedom. Namely, a spinon Kondo effect, where spinons take over the role of itinerant electrons in screening magnetic moments of localized impurities in a metal, was found experimentally for the first time in this material [2]. Both phenomena make spinon metals highly attractive for emerging quantum technologies.

[1] M. Gomilšek *et al.*, Field-Induced Instability of a Gapless Spin Liquid with a Spinon Fermi Surface, Phys. Rev. Lett. **119**, 137205 (2017).
[2] M. Gomilšek *et al.*, Kondo screening in a charge-insulating spinon metal, Nat. Phys. **15**, 754 (2019).

Host: D. Peets