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EINLADUNG zum IFP-SEMINAR

Nontrivial topology in the strong electron correlation limit: the Weyl-Kondo semimetal $Ce_3Bi_4Pd_3$

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Host: Silke Bühler-Paschen
Termin: Freitag, 23. Oktober 2020, 16:00 Uhr
Ort: Join Zoom Meeting
https://tuwien.zoom.us/j/94907261282?pwd=bThwOXY0b3JoMWx6L3l2aUU1dTJkQT09

Abstract:

Strongly correlated electron systems are a fertile ground for novel quantum phases and unconventional physics [1]. The role of electronic topology in the limit of strong electron interaction is only explored since very recently. Heavy fermion compounds appear as highly suitable setting to explore this regime: on one hand, the Kondo coupling between itinerant electrons and a sublattice of localized magnetic moments realizes a highly tuneable ground state with extreme correlation strength, and, on the other hand, heavy constituting elements bring in strong spin orbit coupling.

We have started our search for topologically nontrivial heavy fermion materials by substituting the canonical (noncentrosymmetric) Kondo insulator $Ce_3Bi_4Pt_3$ with Pd, and indeed found evidence for strongly renormalized, linear electronic bands with ultra-slow quasiparticle velocities [2]. Such behavior is expected in a Weyl-Kondo semimetal (WKSM) recently established in an Anderson lattice model, where flat Weyl bands disperse from Weyl nodes that are Kondo-driven to the Fermi energy [3]. Whereas conventional approaches to probe Weyl nodes fail in this setting, this new state of matter features an extreme topological Hall response under preserved time-reversal symmetry [4], elusive in weakly interacting Weyl semimetals. To understand this observation, considerations beyond the perturbative treatment of a “non-linear quantum Hall effect” [5] are needed. Finally, the low energy scales in this compound enable to uncover the stabilizing mechanism of the Weyl-Kondo semimetal state via magnetic field tuning: our magnetotransport and magnetometry study in high magnetic fields reveals the annihilation of the Weyl nodes at a first (topological) quantum phase transition, and a metallization of the system, via a quantum critical point, at a second quantum phase transition [6].

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