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EINLADUNG zum IFP-SEMINAR

Energy-scale Considerations of Unconventional Superconductors
--- implications to condensation and pairing ---

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Host: Silke Bühler-Paschen
Termin: Mittwoch, 19.06.2024, 16:00 Uhr
Ort: TU Wien, Freihausgebäude
Wiedner Hauptstraße 8-10, 1040 Wien
Seminarraum DC rot 07 (roter Bereich, 7. OG)
via ZOOM: https://tuwien.zoom.us/j/63020566887?pwd=RmYvRmVwOGU5YVBrOHpodWRKaHFWQT09

Abstract:

Discovery of high-T_c cuprate superconductors (HTSC) by Bednorz and Muller, followed by synthesis of A_3C_{60}, iron-pnictides/chalcogenides and other exotic superconducting systems, introduced unconventional superconductors having their mechanisms of condensation and/or pairing distinctly different from those of simpler metals which can be explained by BCS theory. In this talk I will show how one can demonstrate their new mechanisms by examining correlations among key energy-scale parameters, including the transition temperature T_c, the superfluid density n_s/m^*, the effective Fermi energy ε_F, the excitation energy of the magnetic resonance mode, the onset temperatures of Nernst effect and light-induced transient superconductivity, and the spin fluctuation energy scale $\hbar\omega_{sf}$. To discuss condensation mechanisms, we will resort to analogy / comparisons with superfluid ^{4}He as a representative system undergoing Bose Einstein Condensation (BEC), and further discuss modifications of a simple BEC-BCS crossover picture to include additional effects of competing order. We will draw attention to development of "local phase coherence" among preformed bosonic pairs in the underdoped HTSC systems, at temperatures well above Tc but well below the pair formation temperature T*. In consideration of a paring mechanism in HTSC, we will propose possible resonance of spin ($\hbar\omega_{sf}$) and charge (ε_F) energy scales, and extend that concept for explaining unusual behaviors in the overdoped region of HTSC.

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[5] Y.J. Uemura, Energy-scale considerations of unconventional superconductors-implications to condensation and pairing, Physica C 614 (2023) 1354361: https://doi.org/10.1016/j.physc.2023.1354361

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