TECHNISCHE UNIVERSITÄT WIEN

INSTITUT FÜR FESTKÖRPERPHYSIK
Institute of Solid State Physics

Wiedner Hauptstr. 8-10/138, 1040 Wien
www.ifp.tuwien.ac.at

EINLADUNG zum IFP-SEMINAR

Superconductivity and other symmetry-broken states in the effective models of copper-based compounds

Michał ZEGRODNIK

Academic Centre for Materials and Nanotechnology, AGH University of Science and Technology, Krakow, Poland

Host:	Neven Barisic
Termin:	Dienstag, 17. Dezember 2019, 15:30 Uhr
Ort:	Institut für Festkörperphysik, TU Wien
	Wiedner Hauptstraße 8-10, 1040 Wien
	Seminarraum DC rot 07 (roter Bereich, 7. OG)

Abstract:

A number of symmetry broken states appear in the cuprate high temperature superconductors. One of the key issues is to identify the mechanism of their creation and how they are interrelated. At the same time, the question of a minimal model which would describe, in a complete manner both the superconducting phase and other symmetry-broken states still remains open. Here, I will show the theoretical results obtained within the effective single- and three-band models of cuprates in the paradigm of strong electronic correlations. In such approach, the symmetry breaking in all the considered states is due to the inter-electronic correlation effects, which are taken into account by the higher order terms of the diagrammatic expansion of the Gutzwiller wave function (the DEGWF method). The selected fundamental properties of the superconducting state resulting from the mentioned approach will be compared with the available experimental data. Also, the translational and four-fold symmetry breaking leading to the charge-density-wave and nematic states are going to be analyzed. In our case, the charge ordering appears together with the Cooper-pair density modulation leading to a coexistent charge- and pair-density wave state (CDW+PDW). As it will be shown, the proposed theoretical approach leads to a proper sequence of phases at the phase diagram with the pure d-wave superconducting phase appearing in the overdoped regime and the modulated states contained in the underdoperd regime, where competition between the pairing and charge-ordering appears. Additionally, the comparison between the single- and three-band models is going to be shown together with the influence of the explicit inclusion of the oxygen degrees of freedom on the SC state.