GOETHE UNIVERSITÄT FRANKFURT AM MAIN

Fachbereich Physik
Institut für Theoretische Physik

CONDENSED MATTER THEORY SEMINAR

Subject: **Orbital-Selective Pairing and Gap Structures of Iron-Based Superconductors**

Speaker: **Dr. Andreas Kreisel, Universität Leipzig**

Date & time: **Friday, February 10th, 2017 at 3:15 p.m.**

Venue: **Seminar room 1.114**

Iron-based superconductors offer an opportunity to study the physical processes that are responsible for high-temperature superconductivity.

The quantum-mechanical processes in these materials lead to a large number of effects and allows for various stable phases. Theoretically, it seems that investigations are stuck because of a fundamental issue.

It is unknown whether the electronic states should be treated in an itinerant approach or using the opposite picture where electrons are almost localized. Guided by recent experiments in the superconducting phase of iron-based superconductors, we discuss the influence on spin-fluctuation pairing theory of orbital selective strong correlation effects in Fe-based superconductors, particularly Fe chalcogenide systems. A key ingredient for an improved itinerant pairing theory is orbital selectivity, i.e. incorporating less coherent quasiparticles occupying specific orbital states into the pairing theory. This approach, based on the Fermi liquid description of a correlated electron system, modifies the usual spin-fluctuation pairing. In detail, pair scattering processes involving more incoherent states are suppressed, which results in orbital selective Cooper pairing of electrons in the remaining states. We show that this paradigm yields remarkably good agreement with the experimentally observed anisotropic gap structures in 3 different materials: Bulk and monolayer FeSe, as well as LiFeAs. This indicates that orbital selective Cooper pairing plays a key role in the more strongly correlated iron-based superconductors.