



Festkörper-Kolloquium und Seminar TRR 80

am Donnerstag, 22.05.14

um 17:15 Uhr

spricht

Prof. Antony Carrington

H.H. Wills Laboratory of Physics

University of Bristol

im HS 3 im Physik-Department

über das Thema

Quantum criticality in iron-based superconductors

Iron pnictide/chalcogenide superconductors present a so-far unique new perspective on the field of unconventional superconductivity. The materials have a relatively high superconducting transition temperature and in contrast to the cuprates, multi-band, multi-orbital physics plays a key role but Mott physics less so. One unique property is that the structure of the superconducting gap function has an unprecedented variation between the different compounds. In some cases, there is a clearly identifiable quantum critical point in the temperature – doping phase diagram and this presents an excellent opportunity to study how quantum critical fluctuations affect (or perhaps cause) the superconducting state.

In this talk I will review experiments identifying the quantum critical point (QCP) in the iron-pnictide superconductor series $\text{BaFe}_2(\text{As}_{1-x}\text{P}_x)_2$. de Haas-van Alphen, magnetic penetration depth and heat capacity results all show clear signatures of a diverging mass at its QCP. The proximity of the QCP yields unexpected anomalies in the superconducting critical fields. We find that both the lower and upper critical fields strongly violate the expectations from conventional theory taking into account the observed mass enhancement near the QCP. This implies that the energy of superconducting vortices is enhanced, possibly due to a microscopic mixing of antiferromagnetism and superconductivity, suggesting that a highly unusual vortex state is realised in quantum critical superconductors.

ab 17:00 Uhr Kaffee vor dem Hörsaal

Einführung: C. Pfeleiderer