TRR 80 Seminar

Am Dienstag, den 29. November um 16:00 Uhr

spricht

Prof. Dr. Jens Müller

Physikalisches Institut, Johann Wolfgang Goethe-Universität Frankfurt am Main

über das Thema

Fluctuation spectroscopy of low-dimensional molecular metals - Electron dynamics near the Mott transition

The Mott metal-insulator transition (MIT) and nearby anomalous states are key phenomena in condensed-matter systems with strong electron-electron interactions. As model systems for studying the physics of correlated electrons and the Mott transition in reduced dimensions, the quasi-2D organic charge-transfer salts k-(BEDT-TTF)2X, where X denotes polymeric anions, become increasingly important.

For these materials, we recently employed fluctuation (noise) spectroscopy as a new approach to study the dynamical properties of the correlated p-carriers at low frequencies, see [1] for a review. Due to the competing interactions, electronically inhomogeneous states are formed at low temperatures, where antiferromagnetic insulating and superconducting phases coexist, and evidence for percolative superconductivity and nanoscale electronic phase separation is found [2].

Here, we focus on the anomalous metallic state in the vicinity of the critical endpoint of the Mott transition. Systematic studies of materials located at different positions in the temperature-pressure phase diagram reveal a correlation-induced enhancement of the resistance noise power spectral density SR in the critical region. We employ a theoretical model that quantitatively describes the temperature and frequency dependence of the normalized noise power SR/R2. From the observed behavior of the 1/f-type fluctuations we draw conclusions about the mechanism of electronic transport in these materials and find a crossover from hopping to 3D coherent transport behaviour in the metallic phase. A main result is that very near the Mott critical endpoint at T0 = 35 K the resistance fluctuations are strongly enhanced, accompanied by a substantial shift of spectral weight to low frequencies (see figure). We interpret this as a sudden slowing down of the electrons' dynamics when approaching the critical point from above and below, and onset of non-Gaussian behaviour at the MIT. A comparison of our findings with MITs in other systems suggests that correlated electron dynamics might be a universal feature, irrespective of the system's dimensionality.

Gäste sind herzlich willkommen!

Der Vortrag findet im Seminarraum S-288/ Physikgebäude Süd, Universität Augsburg statt.

Gastgeber: Prof. Dr. Alois Loidl

www.trr80.de