TECHNISCHE UNIVERSITÄT WIEN
INSTITUT FÜR FESTKÖRPERPHYSIK
WIEDNER HAUPTSTRASSE 8-10
A-1040 WIEN, AUSTRIA
TEL.: ++43-1-58801-13801
FAX: ++43-1-58801-13899
E-MAIL: SEKRETARIAT@IFP.TUWIEN.AC.AT

Einladung zum Seminar

Stefanie Hartmann

Max-Planck-Institut für Chemische Physik fester Stoffe
Dresden

„Thermopower Evidence for an Abrupt Fermi Surface Change at a Quantum Critical Point“

Thermopower is a sensitive method to study electronic low-energy excitations at the Fermi energy. Thermopower, S(T), measurements on the heavy-fermion compound $YbRh_2Si_2$ in the vicinity of its field-induced quantum critical point (QCP) are presented, performed to below T = 30 mK and in magnetic fields up to B = 1 T. A logarithmic behavior of S(T)/T in the non-Fermi-liquid regime as well as the saturation of S(T)/T in the Landau-Fermi-liquid phase are in qualitative agreement with previous specific heat results. However, a pronounced discrepancy between both the field as well as the temperature dependences of specific heat and thermopower are observed in the vicinity of the QCP of $YbRh_2Si_2$. This is at variance with the predictions based on the 2D spin-density-wave scenario that appears to be insufficient to describe the unconventional quantum critical scenario in $YbRh_2Si_2$. A distinct crossover feature is found in the S/T vs. B isotherms, which, in the limit $T \rightarrow 0$, evolves toward a step function with the discontinuity exactly at the critical field B_c. Since the thermopower reflects the energy dependence of the heavy quasiparticle DOS at the Fermi level, $dN(\varepsilon)/d\varepsilon|_{\varepsilon_F}$, it is argued that the abrupt evolution of S(B)/T upon varying the magnetic field indicates an abrupt change of the renormalized Fermi surface at the QCP of $YbRh_2Si_2$. The thermopower observations support previous Hall-effect and are largely consistent with a reconstruction of the Fermi surface at the QCP as predicted for the Kondo break-down scenario.

Host: S. Bühler-Paschen

Mittwoch, 23. Juni 2010, 16:00 Uhr
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Wiedner Hauptstraße 8-10
1040 Wien