Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Sorting Category: 6.2 (T)

Landau Paradigm and Universal Properties of Heavy-Fermion Metals MIRON AMUSIA, Racah Institute of Physics, the Hebrew University, Jerusalem 91904, Israel, ALFRED MSEZANE, CTSPS, Clark Atlanta University, Atlanta, Georgia 30314, USA, VASILY SHAGINYAN, Petersburg Nuclear Physics Institute, RAS, Gatchina, 188300, Russia — We show that the main universal features of the low temperature - magnetic filed experimental T-H phase diagram of the heavy-fermion metal CeCoIn5 and other heavy-fermion metals can be well explained using the Landau paradigm of quasiparticles and order parameters. The main point of our theory is that quasiparticles form fermion-condensate state, achieved by a fermion condensation quantum phase transition (FCQPT). When the system of quasiparticles undergoes FCQPT, the fluctuations accompanying its quantum critical point are strongly suppressed and cannot destroy the quasiparticles. We present for the first time theoretical description of the whole phase diagram of CeCoIn5 including the change of the second order superconducting phase transition to the first-order one under the application of magnetic field. We analyze dynamic conduction recently obtained in measurements on CeCoIn5 and show that the particle-hole symmetry is violated in this metal making both the differential tunneling conductivity and dynamic conduction an asymmetric function of applied voltage. Our description of CeCoIn5 based on the Landau paradigm and FCQPT is in good agreement with facts.

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Date submitted: 21 Jan 2007 Electronic form version 1.4