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Energy scales and magnetoresistance at a quantum critical point MIRON AMUSIA, Racah Institute of Physics, Hebrew University, Jerusalem 91904, Israel, VASILIY SHAGINYAN, Petersburg Nuclear Physics Institute, RAS, Gatchina, 188300, Russia — The magnetoresistance (MR) of CeCoIn55 is notably different from that in many conventional metals. We show that a pronounced crossover from negative to positive MR at elevated temperatures and fixed magnetic fields is determined by the scaling behavior of quasiparticle effective mass. At a quantum critical point (QCP) this dependence generates kinks (crossover points from fast to slow growth) in thermodynamic characteristics (like specific heat, magnetization etc) at some temperatures when a strongly correlated electron system transits from the magnetic field induced Landau Fermi liquid (LFL) regime to the non-Fermi liquid (NFL) one taking place at rising temperatures. We show that the above kink-like peculiarity separates two distinct energy scales in QCP vicinity - low temperature LFL scale and high temperature one related to NFL regime. We show that the same behavior is observed under the application of elevated magnetic field at fixed temperature. These observations are in accord with recent facts (P. Gegenwart, et. al., Science 315, 969 (2007)). Our comprehensive theoretical analysis of experimental data permits to reveal for the first time new MR and kinks scaling behavior as well as to identify the physical reasons for above energy scales.

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