

Quantum critical point from competition between Dirac Kondo effect and chiral symmetry breaking

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We discuss the QCD phase diagram in strong magnetic fields, where the chiral condensate is enhanced by the magnetic catalysis mechanism. In contrast to the conventional discussions, we include heavy-quark impurities that have been known to induce the Kondo effect. We propose a quantum critical point that arises as a consequence of the Kondo effect and the chiral symmetry breaking. Our phase diagram is obtained from a self-consistent determination of the magnitudes of the chiral condensate and the Kondo condensate, which is a particle pairing composed of conducting Dirac fermions and localized impurities. We also discuss finite-temperature effects and implications for condensed matter physics including bilayer graphene.

Koichi Hattori, Daiki Suenaga, Kei Suzuki, Shigehiro Yasui, “Dirac Kondo effect under magnetic catalysis,” Phys.Rev.B 108 (2023) 24, 245110. 2211.16150 [hep-ph]

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