QUARK MATTER 2015
Sep. 27 – Oct. 3, 2015 Kobe, Japan

Contribution ID: **174** Type: **Poster**

QCD Kondo effect in quark matter with heavy flavor impurities

Tuesday, 29 September 2015 16:30 (2 hours)

The Kondo effect has been known as a phenomenon in electron systems with heavy mass impurities having finite spins. This phenomena is caused by imperfect cancelation of the infrared divergences of particle and hole excitations and is realized by a combination of the following ingredients; (0) heavy mass of impurity, (i) existence of Fermi surface, (ii) quantum loop effects, (iii) non-Abelian nature of interaction (e.g. the spin-spin interaction). These are indeed identified in a (light) quark matter with small number of heavy flavor quarks as impurities. In the quark matter, the non-Abelian properties of the interaction is given by the color exchange by gluons (S. Yasui and K. Sudoh, Phys. Rev. C88, 015201 (2013)). This is called the QCD Kondo effect, which modifies the transport properties of the quark matter with heavy flavor impurities, and can be relevant to experiments in the relativistic heavy-ion collisions.

In this presentation, we discuss how the effective coupling strength, between a heavy flavor impurity and a light quark, evolves in the low energy effective theory near the Fermi surface (K. Hattori, K. Itakura, S. Ozaki and S. Yasui, arXiv:1504.07619 [hep-ph]). We investigate the renormalization group flow at the leading log accuracy on the basis of the high-density QCD where the gluon propagator has the static screening mass and the dynamical screening effect for the electric and magnetic components, respectively, and show that the effective coupling becomes divergently large at a certain infrared scale near the Fermi surface, which is called the Kondo scale. This indicates the presence of a strongly coupled regime in the dynamics of the quark matter containing heavy flavor impurities. We find that, while the dynamical magnetic screening provides the dominant effect in the color superconductivity, it is sub-dominant compared to the static electric screening in the QCD Kondo effect.

Primary author: YASUI, Shigehiro (Tokyo Institute of Technology)

Co-authors: ITAKURA, Kazunori (KEK); HATTORI, Koichi (RIKEN-BNL Research Center); OZAKI, Sho (KEK)

Presenter: YASUI, Shigehiro (Tokyo Institute of Technology)

Session Classification: Poster Session

Track Classification: Baryon Rich QCD Matter