Contribution ID: **400** Type: **Poster**

Ultrasoft Fermionic Mode in QED and QCD plasmas

We discuss that the fermion spectrum at an ultrasoft energy region (≪g^2T) in quantum electrodynamics and quantum chromodynamics at high temperature T, where g is the coupling constant. We show that the fermion propagator has a pole at v|p|-i\gamma, where p is the momentum, v=1/3 is the velocity, and \gamma is the damping rate of order g^2T log(1/g). The residue of the pole is weak of order g^2. When a system has conserved charges, soft modes called hydrodynamic modes appear in the bosonic sector. These hydrodynamic modes are zero mode, i.e., the dispersion of the poles is \omega=0 at p=0. The question is whether such a soft mode exists in the fermionic sector, when the system has a peculiar symmetry of the fermions. We show that the pole at the ultrasoft region is related to chiral symmetry, although it is not the exact zero mode. In order to obtain the correct pole, one have to sum over relevant diagrams beyond the hard thermal loop approximation even in the leading order of the coupling. This is similar to the calculation of transport coefficients [1]. We analytically obtain the pole of the fermion propagator and its residue in the leading order by solving a Bethe-Salpeter equation. Such pole was also suggested in Ref. [2], in which the self-consistent equation was shown; however it has not been solved. We also discuss whether this phenomena is robust in the fermion-boson system in the chiral limit.

References

[1] S. Jeon, Phys. Rev. D52, 3591 (1995); Y. Hidaka and T. Kunihiro, Phys. Rev. D 83, 076004 (2011).
[2] V. V. Lebedev and A. V. Smilga, Annals Phys. 202, 229 (1990).

Primary author: Dr HIDAKA, Yoshimasa (RIKEN)

Co-author: SATOW, Daisuke

Presenter: SATOW, Daisuke

Track Classification: QCD at high temperature and density