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Effective description of Collective modes in the hot QCD/QGP medium in the presence of collisions.

Perturbation in the hot QCD plasma generates collective excitations/modes, known as plasmons. These modes are crucial as they contribute to the dynamical evolution of the expanding quark-gluon plasma medium. There has been a number of attempts to understand the dynamical behaviour of the quark-gluon plasma, created out of the heavy ion collision experiments, in terms of collective excitations.
Mathematically, they can be studied from their dispersion law which can be derived from the poles of the propagator which in turn obtained from the polarization tensor. The polarization tensor of the constituent partons and subsequently the dispersion relations have been studied considering the anisotropy in hot QCD medium. Along with the chromo electromagnetic force term (in the abelian limit), the effects of microscopic collisions are further incorporated employing BGK-collisional kernel in the relativistic transport equation, in order to extract the modes in a many-particle kinetic theory approach. The effects of strong interactions at finite temperature have been introduced using an effective quasi-particle model (EQPM), that includes the hot QCD equations of state from 3-loop HTLpt calculations as well as from recent lattice simulations. Finally, all the three the anisotropy (momentum), the collisional effects and the hot QCD medium interaction effects are observed to play a crucial role in describing the characteristics of the collective excitations in QGP.

Summary

Our work on the above abstract has already been published in Physical Review D (an American Physical Journal (APS)).If given a chance, I shall discuss the important as well as the critical features of that in details.

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