Contribution ID: **32** Type: **Oral talk**

Quantum dissipation of quarkonium in quark-gluon plasma: Lindblad equation approach

Tuesday, 25 June 2019 17:30 (25 minutes)

In heavy ion collision experiments, quark-gluon plasma (QGP) is expected to be produced and its physical properties have been discussed. Survival probability of a quarkonium is sensitive to the Debye screening of color charges in QGP. The dynamics of quarkonia can be described by master equation for the density matrix in the open quantum system approach. In this approach, the effect of quantum dissipation can be discussed. In contrast, this effect cannot be described in a simple ''in-medium" Schroedinger equation approach. In our study, we derive the Lindblad master equation for the relative motion of a quarkonium in QGP and solve it numerically. From this, we analyze how the quantum dissipation and the center-of-mass motion of the quarkonium affect the relative motion between the heavy quark antiquark pair. Finally, we present the phenomenological implication of the quarkonium dynamical evolution by solving the master equation in the Bjorken expanding QGP where the temperature decreases with time.

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Session Classification: Session 8