Beitrag ID: **166** Typ: **Talk**

Quarkonia dynamics in the Quark-Gluon Plasma with a quantum master equation

Mittwoch, 29. März 2023 11:10 (20 Minuten)

In recent years, a significant theoretical effort has been made towards a dynamical description of quarkonia inside the Quark-Gluon Plasma (QGP), using the open quantum systems formalism. In this framework, one can get a real-time description of a quantum system (here the quarkonium) in interaction with a thermal bath (the QGP) by integrating out the bath degrees of freedom and studying the system reduced density matrix.

We investigate the real-time dynamics of a correlated charm-anticharm pair inside the QGP using novel coupled quantum master equations derived from first QCD principles and based on the work of Blaizot & Escobedo [1]. The equations are solved numerically in 1D to lessen computing costs and are used to gain insight on the dynamics in both a static and evolving medium following a Björken-like temperature evolution. Several initial conditions will be explored and a study of a possible semi-classical treatment will be presented, in order to see if this approach
can be used to treat multiple charm-anticharm pairs at the same time.

[1]-J. P. Blaizot and M. A. Escobedo, Quantum and classical dynamics of heavy quarks in a quark-gluon plasma, J. High Energy Phys. 06 (2018) 034.

Experiment/Theory

Theory/Phenomenology

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Sitzung Einordnung: Parallel: Heavy Flavours & Quarkonia

Track Klassifizierung: Heavy flavor and quarkonia