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Dynamical quarkonia suppression in a realistic AA background

The suppression of the quarkonium states in AA collisions, observed by the STAR and PHENIX collaborations at RHIC and by the CMS and ALICE collaborations at LHC, is one of the most convincing evidence for the creation of the Quark Gluon Plasma (QGP). The precise survival of excited states vs ground states could even allow to measure the highest temperature reached in those collisions, according for instance to the sequential suppression scenario which is substantiated by calculations of the dissociation temperature based on lattice potentials evaluated at finite temperature.

In our contribution, we address the question of charmonium and bottomonium dissociations resorting to a dynamical approach, i.e. the non-linear Schroedinger-Langevin equation (SLE). In this scheme, a time-dependent real potential reflects the Debye-screening of the heavy quark/antiquark pair self interaction, while a fluctuation/dissipation mechanism expresses its hard interactions with the QGP. The SLE enables to treat the transitions to open quantum states and between bound states, which play an important role for excited state final populations. It allows to consider a realistic compact initial state, made of a linear superposition of eigenstates and to preserve quantum coherence and unitarity in the time-evolution of a pair.
In a stationary QGP, our SLE naturally leads to asymptotic distributions of the states following correct statistical weights, which allows to make the link with models based on the hypothesis of statistical recombination. This sanity check is a unique feature of our approach.

We will describe the most important properties of the SLE. We will then present the suppression prediction resulting from the SLE embedded in the state-of-the-art EPOS evolution scenario of the QGP background. Including initial cold nuclear matter effects, the pT and centrality dependences of the yields will be discussed both for RHIC and LHC energies.

References:

- Annals of Physics 368 (2016) 267-295
- arXiv:1601.01443 (accepted for publication in Nuclear Physics A)

Preferred Track

Quarkonia

Collaboration

Not applicable

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