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Quantum Regeneration of Bottomonia in Heavy Ion Collisions

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For decades, heavy quarks and their bound states have served as ideal experimental and theoretical probes of the medium formed in heavy ion collisions. Specifically, suppression of heavy-heavy bound states in heavy ion relative to proton-proton collisions was postulated as a strong signal of the formation of a deconfined quark gluon plasma. More recently, the use of effective field theories (EFTs) and the formalism of open quantum systems (OQS) has allowed for great advances in first principles descriptions of in-medium heavy-heavy bound states. Using EFTs, one can systematically exploit the hierarchies of scale of the combined system to arrive at an effective description valid in a particular regime while the OQS formalism enables a quantum description of a system evolving coupled to and out of equilibrium with an environment. In this talk, we present recent results obtained by solving the Lindblad equation derived using the EFT potential nonrelativistic QCD and the OQS formalism describing the in-medium evolution and suppression of the Y(1S), Y(2S) and Y(3S) states. We emphasize our good agreement with experimental data from the ALICE, ATLAS and CMS collaborations and the necessity of quantum regeneration to accurately describe the suppression of the excited states and double ratios thereof.

Category

Theory

Collaboration (if applicable)

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