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Quarkonia and heavy quarks as a probe of QCD Media

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Heavy particles are good probes of a strongly interacting hot medium. In particular quarkonia are endowed with a hierarchy of energy scales related to their nonrelativistic dynamics, the scale of the mass, of the momentum transfer, of the binding energy plus the scale of nonperturbative physics that make them to a unique probe of the Quark Gluon Plasma. In this talk, I will show how, putting together a nonrelativistic effective field theory and an open quantum system description, we can use the in medium nonequilibrium evolution of quarkonia with small radius to investigate and characterize the properties of the QGP in terms of two nonperturbative parameters: the heavy quark transport coefficient and its dispersive counterpart. We obtain a Lindblad equation in potential Non Relativistic QCD that fully accounts for the quantum and non-Abelian nature of the system. By solving this equation using the highly efficient Monte Carlo wave-function method and realistically implementing it through a 3+1D dissipative hydrodynamics code, we obtain the bottomonium nuclear modification factor and compare with the most recent LHC data. The computation does not rely on any free parameter, as it depends on the two transport coefficients that have been evaluated independently in lattice QCD. Our final results, which include late-time feed down of excited states, agree well with the available data from LHC 5.02 TeV PbPb collisions.