Contribution ID: **93** Type: **Oral presentation**

Heavy quarkonium dynamics at next-to-leading order in the binding energy over temperature

Friday 29 July 2022 09:00 (45 minutes)

Using the potential non-relativistic quantum chromodynamics (pNRQCD) framework we derive a Lindblad equation for the evolution of the heavy-quarkonium reduced density matrix that is accurate to next-to-leading order (NLO) in the ratio of the binding energy of the state and the temperature. The resulting NLO Lindblad equation can be used to more reliably describe heavy-quarkonium evolution in the quark-gluon plasma at low temperatures when compared to the leading-order truncation. In order to apply this to phenomenology, we demonstrate how to numerically solve the resulting NLO Lindblad equation using a quantum trajectories algorithm. To achieve this, we map the solution of the three-dimensional Lindblad equation to the solution of an ensemble of one-dimensional Schr\"odinger evolutions with Monte-Carlo sampled quantum jumps. Upon averaging over the Monte-Carlo sampled quantum jumps, we obtain a solution to the NLO Lindblad equation which does not require truncation in the angular momentum quantum number of the states considered. We also investigate evolving the system using only the complex effective Hamiltonian without stochastic jumps and demonstrate that this provides a quite reliable approximation for the ground state survival probability at NLO. Finally, we make comparisons with our prior leading-order pNRQCD results and experimental data available from the ATLAS, ALICE, and CMS collaborations.

Presenter: STRICKLAND, Michael (Kent State University)

Session Classification: Session