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Efficiently simulating quarkonium's master equation beyond the dipole approximaton

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QTRAJ is a computer code that simulates the propagation of quarkonium in the quark-gluon plasma (QGP) based on the quantum trajectories' algorithm. This algorithm solves a master equation in which the quarkonium is treated as an open quantum system (OQS). The specific master equation is obtained through the potential non-relativistic QCD (pNRQCD) approach, but so far has been restricted to the regime rT « 1, where r is the size of the color dipole and T is the temperature. This limit is accurate for $\Upsilon(1S)$ but the applicability to other quarkonium states is dubious.
A major advantage of this approach is that it turns a 3D spatial evolution into a 1D Schrödinger equation with a non-hermitian Hamiltonian, drastically reducing the computational cost.
We generalize the code by extending to the regime rT ~ 1 in the one-gluon exchange approximation. This is done by implementing new jump operators between the resonances and expanding them in plane waves, giving rise to a variation of the algorithm present in QTRAJ 1.0. We will be showing a review of this approach comparing the rT«1 and rT~1 cases, and we will discuss prospect for phenomenological application to excited states.

session

F. Heavy Flavor and Quarkonia

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