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Efficiently simulating quarkonium's evolution beyond the dipole approximation

The open quantum system framework allows one to compute quarkonium's evolution in a medium, keeping track of the needed quantum features. However, computing this evolution is a computationally demanding task. QTRAJ is an efficient code that allows one to simulate the behavior of quarkonium in a medium in the case in which the medium sees quarkonium as a small color dipole $rT \ll 1$. While this limit is accurate for $\Upsilon(1S)$, its applicability to other quarkonium states is unclear. In this talk, wwe present a generalization of this code that incorporates the regime where $rT \sim 1$ in the one-gluon exchange approximation. In its new version, QTRAJ implements new jump operators connecting different states, which are then expanded in plane waves, giving rise to a variation of the algorithm present in QTRAJ 1.0 where jumps with $\Delta\ell > 1$ are allowed. We will show a review of this approach comparing the $rT \ll 1$ and $rT \sim 1$ cases, and we present preliminary phenomenological results.

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