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The complex heavy-quark potential in an anisotropic quark-gluon plasma - Statics and dynamics

We generalize a complex heavy-quark potential model from an isotropic QCD plasma to an anisotropic one by replacing the Debye mass m_D with an anisotropic screening mass depending on the quark pair alignment with respect to the direction of anisotropy.
Such an angle-dependent mass is determined by matching the perturbative contributions in the potential model to the exact result obtained in the Hard-Thermal-Loop resummed perturbation theory. An advantage of the resulting potential model is that its angular dependence can be effectively described by using a set of angle-averaged screening masses as proposed in our previous work. Consequently, one could solve a one-dimensional Schrodinger equation with a potential model built by changing the anisotropic screening masses into the corresponding angle-averaged ones, and reproduce the full three-dimensional results for the binding energies and decay widths of low-lying quarkonium bound states to very high accuracy. Finally, turning to dynamics, we demonstrate that the one-dimensional effective potential can accurately describe the time evolution of the vacuum overlaps obtained using the full three-dimensional anisotropic potential. This includes the splitting of different p-wave polarizations.

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