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Understanding the spin-spin interactions among heavy quarks at finite temperature

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In this work we calculate the non-perturbative potential between a heavy quark and an anti-quark pair in a QCD plasma at finite temperature. Extracting the leading order static potential $V_s(r)$ from the temporal Wilson line correlators we then calculate the spin dependent component $V_{ss}(r)$ at $\mathcal{O}(1/M^2)$, using color-magnetic field insertions. The computations have been performed for quenched QCD, at $1.2, 1.5$ times the deconfinement temperature T_d, on a 4D lattice
with spacing $a = 0.026$ fm, spatial extent $N_s = 68$ and temporal size $N_\tau = 16, 20$ and compared with a zero temperature calculation at $\approx 0.25\ T_d$, on a 32^4 lattice. We show that $V_{ss}(r)$ develops an imaginary part at finite temperature, a similar phenomenon observed in the static potential. Reconstructing the quarkonium spectral functions for both pseudo-scalar and vector channels using the spin-dependent non-perturbative potential we observe different decay widths of these states. We discuss the physical implications of our study for understanding the melting of quarkonium bound states in the quark-gluon plasma.

Parallel Session (for talks only)

QCD at nonzero temperature and density

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