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Quarkonium potential in QCD medium with momentum dependent relaxation time

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In this work, we studied the in-medium behavior of quarkonia (charmonium) in a hot QCD medium using a modified kinetic theory framework that includes momentum-dependent relaxation times. The longitudinal gluon self-energy and Debye screening mass are computed within the one-loop hard thermal loop approximation, incorporating non-equilibrium corrections. We analyze how the quarkonium potential, binding energy, and thermal width are affected by the momentum dependence of the relaxation time. Our results show significant deviations from the standard relaxation time approximation, highlighting the importance of non-equilibrium effects in modeling quarkonia suppression in heavy-ion collisions.

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