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Meson Mass Modifications in Hot and Dense QCD Matter via a Complex Heavy-Quark Potential

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We present a method to determine the masses of heavy quarkonium mesons modified by medium effects at finite temperature and density by solving the radial Schrödinger equation with a complex heavy-quark potential derived from an improved Gauss law model. This potential incorporates medium screening through a temperature- and density-dependent Debye mass parameter, featuring a real part that accounts for Debye screening and an imaginary part describing in-medium decay processes. By extracting the binding energies from the numerical solutions and adding the constituent quark masses, we compute temperature- and density-dependent meson masses. The approach reproduces known vacuum meson masses at zero temperature and predicts consistent mass shifts in the medium, providing a reliable framework for studying in-medium meson mass modifications.

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