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Heavy quark-antiquark interaction in finite temperature lattice QCD

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Heavy quarkonia are important probes of the matter created in heavy ion-collisions. The complex heavy-quark potential is an essential ingredient of dynamical models of quarkonium production in heavy-ion collisions, e.g. in models based on open quantum system approach.
We calculate the complex heavy-quark potential in (2+1)-flavor QCD with physical quark masses on the lattice using large temporal extent. The heavy-quark potential is extracted from the Wilson line correlators in Coulomb gauge. Then we extract the underlying spectral functions using multiple conceptually different analysis methods – spectral function fits, an HTL inspired fit for the correlation function, Padé rational approximation and the Bayesian BR spectral reconstruction and compare the implications of each for the existence and properties of a well defined dominant spectral peak.
The peak position corresponds to the real part of the potential, while the width corresponds to the imaginary part of the potential. While all the methods roboustly point toward a significant imaginary part of the potential that increases with increasing separation between quark and antiquark, the expected screening of the real part of the potential is not evident in our calculations.

References:

[1] D. Bala et al, e-Print: 2110.11659 [hep-lat], submitted to PRD
[2] D. Hoying et al, Contribution to: Lattice 2021, e-Print: 2110.00565 [hep-lat]

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