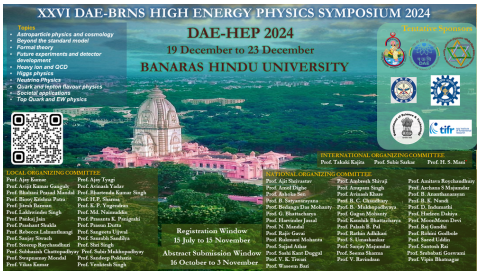

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Advancing Confinement Studies in QCD: Meson Spectra Analysis with New Potentials in Light-Front Holography

Quantum Chromodynamics (QCD) is the fundamental theory that describes strong interactions, which is an interesting problem in the non-perturbative regime due to the quark confinement and strong coupling of interactions. In Light-front holography (LFH), a favorable approach is studied to acknowledge these intricacies by mapping QCD onto a higher-dimensional anti-de Sitter (AdS) space, allowing an effective 4-dimensional description of hadron physics. In this study, we investigate the introduction of novel confining potentials, such as Coulomb and Yukawa, into an updated hadron model within the LFH framework. We consider the importance of these potentials by computing the longitudinal eigenmass and examining the resulting Regge trajectories for selected mesons. The theoretical predictions are then compared with observed values from the Particle Data Group (PDG) to test the consistency of the model. The research utilizes computational tools, including Python for numerical analysis and Mathematica for symbolic calculations, to solve the model equations and to conduct a rigorous analysis. Our goal is to understand the alignment of these potentials with the meson mass spectra, potentially improving the interpretation of confinement mechanisms in QCD.

Field of contribution

Theory

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