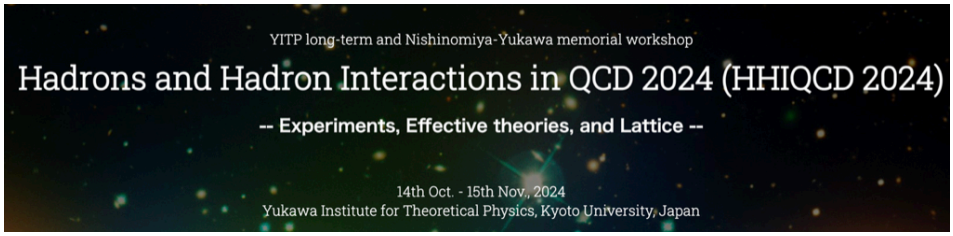

Contribution ID: **89** Type: **1st and 2nd weeks (Hadron structure and interactions)**

Mass and Interaction of 1^+ Diquark and Charm Quark in Σ_c

Thursday, October 17, 2024 2:30 PM (30 minutes)

In this study, we present a lattice QCD analysis of the $J^P = 1^+$ diquark within the charmed baryon $_c^{++}(uuc)$.

Treating $_c$ as a bound state of a charm quark and a uu 1^+ diquark, we utilize an extended HAL QCD potential method to determine both the mass of the 1^+ diquark and the potential between the charm quark and the 1^+ diquark.

Unlike the standard HAL QCD approach, the mass of the 1^+ diquark is a non-trivial quantity that cannot be straightforwardly obtained from the two-point correlator due to the color confinement.

To address this, we employ the Kawanai-Sasaki extension of the HAL QCD method, originally developed to self-consistently determine the charm quark mass alongside the ccbar potential within the HAL QCD framework.

Our lattice QCD Monte Carlo calculations are performed using 2+1 flavor QCD gauge configurations on a $L^3 \times T = 32^3 \times 64$ lattice, generated by the PACS-CS collaboration, corresponding to a pion mass of approximately 700 MeV.

We find a spin-independent central potential of Cornell-type along with a short-ranged, spin-dependent central potential, which takes the form of a smeared delta-function.

The resulting mass of the 1^+ diquark is about 867 MeV, slightly lower than anticipated. This discrepancy is likely due to statistical noise in the Nambu-Bethe-Salpeter wave functions at long distances.

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