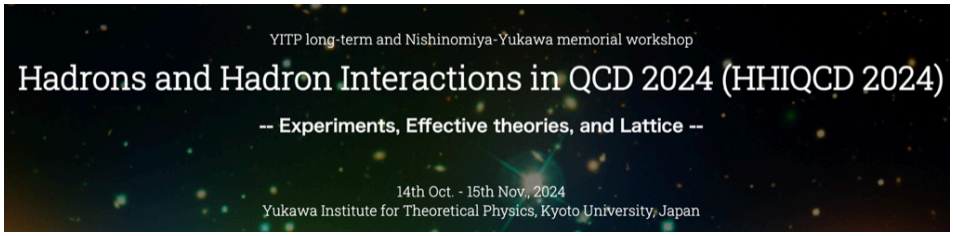

Contribution ID: **90** Type: **1st and 2nd weeks (Hadron structure and interactions)**

Diquark Mass and Quark-Diquark Potential from Lattice QCD

Thursday, October 24, 2024 2:30 PM (30 minutes)

In this work, to calculate the diquark mass together with the quark-diquark potential, we apply an extended HAL QCD potential method to a baryonic system made up from a static quark and a diquark where we consider various types of diquarks (eg: scalar 0^+ diquark, axial-vector 1^+ diquark etc). Numerical calculations are performed employing 2+1 flavor QCD gauge configurations generated by CP-PACS and JLQCD Collaborations on a $L^3 \times T = 16^3 \times 32$ lattice with $m_\pi \sim 1$ GeV. We consider several combinations of source and sink operator for the quark propagators, for example, wall-source with point sink and Gaussian smeared source with Gaussian smeared sink etc. To improve the statistical noise in the propagators of the static quark, we also employ the HYP smearing on the gauge links. Two-point correlators of quark-diquark baryonic system are then computed to obtain their ground-state energies. For the baryonic system made up from a scalar diquark and a static quark, we apply an extended HAL QCD method to study the scalar diquark mass and the quark-diquark potential where, in order to determine the diquark mass self-consistently in the HAL QCD method, we demand that the baryonic spectrum in the p-wave sector should be reproduced by the potential obtained from the baryonic system in the s-wave sector. We obtain the scalar diquark mass of roughly $(2/3)m_N$, i.e., twice the naïve estimates of a constituent quark mass together with the quark-diquark potential of Cornell type (Coulomb + linear).

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Session Classification: Seminar (1,2 week)