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Lattice QCD study of baryon-baryon interactions in the (S,I)=(-2,0) system using the coupled-channel formalism

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We investigate baryon-baryon interactions with strangeness S=-2 and isospin I=0 system from Lattice QCD.
The study of S=-2 system opens a gate of multi-strangeness hadronic world and provides the unified understanding of YN and YY interactions.
A satisfactory description of YN and YY interaction is not yet obtained with use of phenomenological meson exchange model due to the lack of the direct measurement of hyperon-hyperon scattering to determine many free parameters.
It is important to understand these interactions directly from QCD.

In order to solve this system, we prepare three types of baryon-baryon operators (Lambda-Lambda, N-Xi and Sigma-Sigma) and construct three operators diagonalizing the 3x3 correlation matrix.
Combining of these sink operators with the diagonalized source operators, we obtain nine effective Bethe-Salpeter wave functions.
The 3x3 potential matrix is calculated by solving the coupled-channel Schroedinger equation.
The flavor SU(3) breaking effects of the potential matrix are also discussed by comparing with the results of SU(3) limit in the same calculation.

Our numerical results are obtained from 2+1 flavor QCD gauge configurations with m_pi = 870 MeV and m_pi/m_K = 0.95, provided by the CP-PACS/JLQCD Collaborations.

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talk

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