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Searching for evidence of diquark states using lattice QCD simulations

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In recent years, exotic hadrons called X, Y, Z which cannot be explained by the quark model have been found one after another. For example, the tetraquark state, which is one of the typical scenarios to interpret the exotic state, is based on the existence of a diquark state. The discovery of a pentaquark state at CERN in July last year also makes a diquark state even more important. It is well known that an attraction between two quarks can be enhanced in the color anti-triplet, flavor anti-symmetric, spin singlet, positive parity channel and this diquark is called good diquark. Our main subject is to check if a lattice QCD simulation with 2 flavor Wilson fermions actually supports this statement. For this objective, we calculate diquark mass difference between good diquark and other diquarks and also analyze density distribution of diquarks through calculation of density-density correlators.

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