



Contribution ID: 248

Type: Talk

Chiral Properties of Pseudoscalar Meson in Lattice QCD with Domain-Wall Fermion

Wednesday, 25 June 2014 10:20 (20 minutes)

We study the chiral properties of the pseudoscalar meson in 2-flavors lattice QCD with optimal domain-wall fermion. The gauge ensembles are generated on the $24^3 \times 48$ lattice with the extent in the fifth dimension $N_s = 16$, and the plaquette gauge action at $\beta = 6.10$, for three sea-quark masses corresponding to the pion masses in the range 265-465 MeV. We calculate the mass and the decay constant of the pseudoscalar meson, and compare our data with the chiral perturbation theory (ChPT). We find that our data is in good agreement with the sea-quark mass dependence predicted by the next-to-leading order (NLO) ChPT, and provides a determination of the low-energy constants \bar{l}_3 and \bar{l}_4 , the pion decay constant, the chiral condensate, and the average up and down quark mass.

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Session Classification: Chiral Symmetry

Track Classification: Chiral Symmetry