Recent Results on Strange Systems from QCD Sum Rules and Lattice QCD

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QCD has been proved to be the fundamental theory of the strong interaction. It is important to approach strange hadron- and nuclear-systems from the QCD viewpoints. Recent approaches of applying QCD directly to the strange multi-quark systems are fruitful. Some of the results are reported.

(1) The meson-baryon coupling constants have been evaluated in the QCD sum rules and also in the lattice QCD[1]. In particular, we concentrate on the SU(3) symmetry of the ps-meson-octet-baryon couplings. It is found that the F/D ratio in the SU(3) limit is consistent with the SU(6) symmetry. The SU(3) violation in the realistic quark masses is weak and nonsignificant. The $N_f = 2$ full lattice QCD simulation gives consistent results with the QCD sum rule.

(2) The reliable results from the QCD sum rule for the Θ^+ pentaquark state are obtained[2]. In order to improve the pole contribution versus continuum background, subtraction of two carefully-chosen correlation functions is employed. We predict a spin $J = 3/2$ state in the mass region of $1.5 \pm 0,2$ GeV.

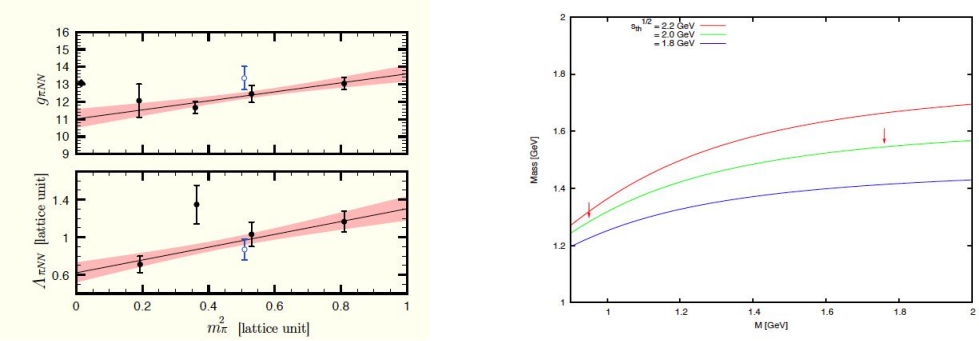

Figure 1: [Left] The πNN coupling constants in the $N_f = 2$ full lattice QCD. [Right] The mass of the pentaquark Θ^+ in the QCD sum rule

[1] T. Doi, Y. Kondo, M. Oka, Phys. Rept. 398 (2004) 253; G. Erkol, M. Oka, Phys. Lett. B659 (2008) 176; G. Erkol, M. Oka, T.T. Takahashi, arXiv:0805.3068 [hep-lat]
[2] P. Gubler, et al., to be published.