

# Studies on meson-baryon interactions in the HAL QCD method with all-to-all propagators

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We investigate meson-baryon interactions in the HAL QCD method with all-to-all propagators using the stochastic estimations. We mainly report the analysis of the S-wave kaon-nucleon interactions at  $m_\pi \approx 570$  MeV. Since there are no quark-antiquark creation/annihilation processes in this system, all-to-all propagators merely play a role in increasing statistics. In addition, we present the preliminary results for the P-wave pion-nucleon interaction in the  $I = 3/2$  channel using the  $\Delta$  source operator on a small volume at  $m_\pi \approx 870$  MeV, which has a bound state corresponding to the  $\Delta(1232)$  state.

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