Meson-baryon interactions and Λ(1405) in covariant chiral effective field theory

Xiu-Lei Ren*

School of nuclear science, energy and power engineering, Shandong University, Jinan 250061, China

Content

We investigated meson-baryon scattering using time-order perturbation theory based on covariant chiral effective field theory. Renormalized scattering amplitudes were obtained by solving the integral equations with the full off-shell dependence of effective potentials and applying subtractive renormalization. Our formalism has been successfully applied to the pion-nucleon scattering at leading order and extended to meson-baryon scattering in the $S = -1$ sector. By solving the coupled-channel integral equations, we obtained the two-pole structure of the Λ(1405) resonance. Confronting the recent lattice QCD study, we investigated the light-quark mass dependence of Λ(1405) two poles. Our parameter-free prediction of pole positions agrees with the results of BaSc Collaboration. Furthermore, we would like to present the preliminary results of the ongoing work at the next-to-leading order on meson-baryon interactions.

Reference

[1] Xiu-Lei Ren, E. Epelbaum, J. Gegelia and U.-G. Meißner, Meson-baryon scattering in resummed baryon chiral perturbation theory using time-ordered perturbation theory, Eur. Phys. J. C80 (2020) 406
[2] X.-L. Ren, E. Epelbaum, J. Gegelia and U.-G. Meißner, The Λ(1405) in resummed chiral effective field theory, Eur. Phys. J. C 81 (2021) 7, 582
[3] Xiu-Lei Ren, Light-quark mass dependence of the Λ(1405) resonance, Phys. Lett. B 855, 138802 (2024)
[4] Xiu-Lei Ren, et al., in preparation

Field of Research: Interactions of mesons and baryons with strangeness
Experiment / Theory: Theory
Contribution Type: Contribution talk