The 38th International Symposium on Lattice Field Theory

LATTICE 21

JULY 26-30 2021, ZOOM/GATHER@MIT

Contribution ID: **232** Type: **Oral presentation**

Finite volume analysis on systematics of the derivative expansion in HAL QCD method

Thursday, 29 July 2021 21:45 (15 minutes)

We study the systematic error associated with the truncation of the derivative expansion for the potential in HAL QCD method. We introduce the Hamiltonian with the leading-order potential determined in the HAL QCD method and study the corresponding eigenmodes in a finite volume. We show that a temporal correlation function of a designated energy eigenstate can be obtained using the finite-volume eigenwavefunction as a projection operator. This enables us to make quantitative comparison between Luscher's method and HAL QCD method in terms of the energy spectra in a finite volume, avoiding the notorious pseudo-plateau problem in a temporal correlation function [1].
Numerical investigations are performed for the Omega_ccc - Omega_ccc (1S0) system near the physical point [2]. We observe consistency in finite volume spectra, which indicates that the truncation error of derivative expansion is small in this system. This study also gives clear demonstration that the potential (and thus phase shifts/binding energy) can be reliably extracted from the NBS wave function for elastic excited states.
[1] T. Iritani et al. (HAL QCD Coll.), JHEP 03 (2019) 007, arXiv:1812.08539 [hep-lat].
[2] Y. Lyu, H. Tong et al., arXiv:2102.00181 [hep-lat].

Primary authors: DOI, Takumi; LYU, Yan (Peking University); TONG, Hui (Peking University); SUGIURA, Takuya (RIKEN); AOKI, Sinya (Kyoto University); HATSUDA, Tetsuo (RIKEN); MENG, Jie (Peking University); Mr MIYAMOTO, Takaya (Yukawa Institute for Theoretical Physics, Kyoto University)

Presenter: DOI, Takumi

Session Classification: Hadron Spectroscopy and Interactions

Track Classification: Hadron Spectroscopy and Interactions