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Properties of non-local wave function equivalent potential with generalized derivative expansion

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HAL QCD collaboration has mostly considered the lowest order potential of the derivative expansion so far based on the assumption that higher order terms yield minor correction in low energy region.

In this study, we aim at investigating the properties of HAL QCD's non-local potentials when the derivative expansion is explicitly performed to higher order. We report the result of our model calculation in a 1+1 dimensional coupled-channel system.

We introduce a generalized version of the derivative expansion and show that the potential reproduces scattering phase shift quite well.

The generalized expansion has some favorable features which is also applicable to the actual lattice QCD calculations.

The possibility of improving the convergence of the expansion is also discussed in this framework.

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