Abstract

Three-body resonances in the $\bar{K}NN - \pi YN$ and $\bar{K}\bar{K}N - \pi\bar{K}Y$ systems are investigated within the framework of the coupled-channel Faddeev equations. We determine the resonance energies of the three-body systems from the resonance poles of the three-body amplitudes by analytic continuation of coupled-channel Faddeev equations. The most important interaction to study these systems is the low energy $\bar{K}N$ interaction. We construct the model of the low energy $\bar{K}N$ interaction from the leading order term of the chiral effective Lagrangian, which describes well the dynamics of the $\Lambda(1405)$ resonance in isospin $I = 0$ $\bar{K}N - \pi\Sigma$ channel.

In the $\bar{K}NN - \pi YN$ three-body system, we find the resonance pole of the three-body amplitudes on the $\bar{K}NN$ physical and the πYN unphysical sheet. We study the effects of the low energy $\bar{K}N$ interaction on the three-body resonance energy, and we find that the three-body resonance is strongly affected by the nature of the $\Lambda(1405)$. Moreover we also find that the coupled-channel dynamics of the $\bar{K}NN - \pi YN$ system should be explicitly taken into account to determine the resonance energy.

In the $\bar{K}\bar{K}N - \pi\bar{K}Y$ system, the low energy $\bar{K}\bar{K}$ interaction is taken into account together with the $\bar{K}N$ interaction. Recent lattice QCD calculation and chiral perturbation theory predict that the low energy $\bar{K}\bar{K}$ interaction is strongly repulsive. The model of the $\bar{K}\bar{K}$ interaction is also derived from the leading order term of the chiral effective Lagrangian. We find that the $\bar{K}\bar{K}$ interaction plays an important role to study double-$\bar{K}$ systems.