Compositeness of hadrons and near-threshold dynamics

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The understanding of the structure of exotic hadrons in the strange and heavy sectors is the central issue in hadron physics. We present the recent developments in the studies of the structure of hadron resonances, focusing on the notion of the compositeness in terms of the hadronic degrees of freedom.

The compositeness of particles has been intensively discussed in early 1960's to clarify their elementary/composite nature. In general, the compositeness is a model-dependent quantity. On the other hand, the compositeness of the weakly bound states can be related to the observables in the low energy scattering through the model-independent formula in the weak binding limit [1]. For instance, the compositeness of the deuteron can be understood solely by the scattering length and the effective range. Although the compositeness of exotic hadrons has recently been evaluated in various model calculations (see Ref. [2]), the applicability of the model-independent formula is limited due to the preconditions.

In this talk, we first discuss that the compositeness of the near-threshold bound states is model-independently determined, thanks to the low-energy universality. The weak binding formula is then generalized to the case of near-threshold resonances [3]. As an aplication, we show that the structure of $\Lambda_c(2595)$ is not dominated by the $\pi\Sigma_c$ molecule state. We also discuss the hadron mass scaling near the threshold which is closely related to the property of the bound state in the weak binding limit [4].

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