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Hidden-charm meson-baryon molecules with a short-range attraction from five quark states

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The observation of the hidden-charm pentaquarks by the LHCb collaboration indicates an existence of exotic hadrons close to hidden-charm meson-baryon thresholds. In the literature, various model calculations have been performed such as the hadronic molecules and the compact multi-quark states. The observed states appear below the thresholds, and it indicates that the states are a loosely bound state of the hidden-charm meson-baryon. On the other hand, in the quark cluster model, the compact five-quark states are discussed to describe the short range part of the interaction.

In this talk, we study the hidden-charm pentaquark systems as a molecule of $\bar{D}^{(*)}\Lambda_{\rm c}$ and $\bar{D}^{(*)}\Sigma_{\rm c}^{(*)}$ with coupling to the five-quark state ($qqqc\bar{c}$), where the three light quark part (qqq) is the color octet. The five-quark component is introduced as the short range potential between the meson and the baryon. The long range force is given by the one pion exchange potential (OPEP). By solving the Schr\"odinger equation, we study the bound and resonant states for $J^P=\frac{1}{2}^-$, $\frac{3}{2}^-$ and $\frac{5}{2}^-$ with isospin $I=\frac{1}{2}$.In the charm sector, we obtain that the short range potential plays an important role to produce the states, while we obtain no state only with the OPEP. The spectrum structure is affected by the spectroscopic factor of the coupling between the five-quark and the meson-baryon components.

Author: YAMAGUCHI, Yasuhiro (RIKEN)

Co-authors: GIACHINO, Alessandro (INFN - National Institute for Nuclear Physics); TAKEUCHI, 竹内幸子; SANTOPINTO, Elena (INFN e Universita Genova (IT)); TAKIZAWA, Makoto; HOSAKA, Atsushi (Osaka University)

Presenter: YAMAGUCHI, Yasuhiro (RIKEN)

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