Contribution ID: **844** Type: **Oral presentation**

Charmed hadron interactions and correlation functions

Thursday, April 7, 2022 10:00 AM (20 minutes)

Charmed hadron interactions are very important in current exotic hadron physics. For example, charmed pentaquark state (P_c) appears around the $\Sigma_c \bar{D}^{(*)}$ thresholds, and then P_c's are suggested to be hadron molecules caused by the attraction between Σ_c and $\bar{D}^{(*)}$. While it is difficult to perform charmed hadron scattering, recent femtoscopic studies allows us to get information on charmed hadron interactions. Since the correlation function $C(q)$ is given as the convolution of the source function and the wave function squared, $C(q)$ tells us how much the wave function is enhanced or suppressed from the free case provided that the source function is known.

In this presentation, we discuss the charmed hadron interactions and correlation functions [1]. Specifically, we consider $pD^{\pm}$, DD^* and $D\bar{D}^*$ pairs, which are related to the (singly) charmed pentaquark state, T_{cc}, and $X(3872)$, respectively. As the first step, we use one-range Gaussian potentials whose strength are determined to reproduce the scattering lengths in theoretical models (DN and $\bar{D}N$) or the binding energies (DD^* and $D\bar{D}^*$). The calculated correlation functions show significant dependence on the interactions and the source size. Thus measurement of these correlation functions will judge theoretical models and the molecule picture of exotic hadrons.

[1] Y. Kamiya, T. Hyodo, and A. Ohnishi, in preparation.

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Session Classification: Parallel Session T07: Correlations and fluctuations

Track Classification: Correlations and fluctuations