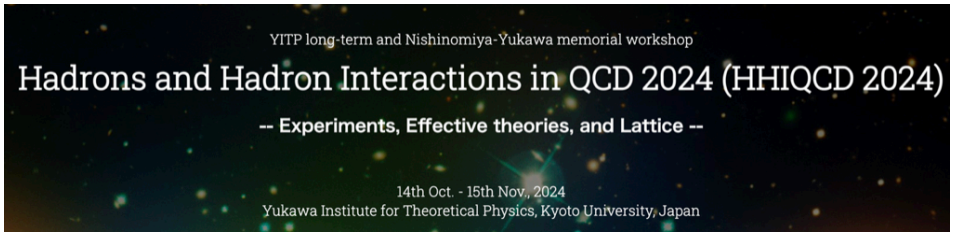

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Higher partial waves in femtoscopy

Monday, October 21, 2024 3:30 PM (1 hour)

Recently, femtoscopy in high-energy heavy-ion collisions has been gathering attention as a new approach to hadron-hadron interaction, and two-particle momentum correlation is widely measured in experiments [1]. Existing studies have mainly assumed the s-wave interaction, where the contributions from p-wave and d-wave have been neglected for simplicity. However, the correlation function gets contributions from all higher partial waves in general. The effect becomes particularly significant in the presence of resonances of higher partial waves. For example, a peak observed in the K-p correlation [2] is attributed to the d-wave resonance $\Lambda(1520)$.

In this talk, we discuss the effect of higher partial waves on the correlation function based on the Koonin-Pratt formula, which gives the correlation function as an integral of the two-particle source $S(\mathbf{r})$ and the relative wave function $\phi_{\mathbf{q}}^{(-)}(\mathbf{r})$. We first consider the partial-wave expansion of the correlation function under the spherical source, where the correlation is shown to be the sum of the contributions from each wave. We also attempt an extension of the Lednicky–Lyuboshits (LL) formula [3] for the s-wave interaction. Assuming a short interaction range, a Gaussian source, and the effective range expansion of the s-wave scattering amplitude f_0, the LL formula gives a parametrized form of the correlation function in terms of the scattering length a_0 and the effective range r_0. Using similar assumptions, we obtain a generalized LL formula for the higher partial waves. In this procedure, we give an insight into the structure of the LL formula and discuss a relation to the optical theorem. We also check the applicability of the generalized LL formula using typical potentials such as the potential well.

[1] S. Cho et al. [ExHIC], Prog. Part. Nucl. Phys. 95, 279-322 (2017).
[2] S. Acharya et al. [ALICE], Phys. Rev. Lett. 124, no.9, 092301 (2020).
[3] R. Lednicky and V. L. Lyuboshits, Yad. Fiz. 35, 1316-1330 (1981).

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