Contribution ID: **137** Type: **Parallel**

Correlation Function constraints on S=-2 meson-baryon interaction from UChPT.

Saturday, 24 June 2023 15:20 (20 minutes)

As it is well known, for heavier hadrons, there is no possibility of performing scattering experiments due to technical limitations related to the extremely short life time of these particles. Instead, Lattice QCD (LQCD) simulations have played a key role in understanding the dynamics of heavy sectors, being more precise. A successful reproduction of the lattice data is regarded as a strong evidence that the Effective Field Theory EFT employed to such an end can describe reality in the energy regime considered. This leads one to see LQCD as a benchmark scheme to discriminate among theoretical models developed from EFTs in use. However, due to the lack of experimental data in these sectors, the theoretical models have been limited to describe the current hadron spectroscopy or to predict new states (exotic or not) that can be seen in different decay processes.

In contrast, the promising Femptoscopy Techinique in High-Energy Nuclear Collisions offers a direct connection to experimental observables, from which the corresponding scattering parameters can be extracted. The reason lies in the fact that, in high-energy heavy-ion collisions and high-multiplicity events of pp, pA and AA collisions, the hadron production yields are well described by the statistical models, thereby leaving the correlations between outgoing particles relying upon the final state interactions.

In this theoretical study, for the first time, an experimental Correlation Function (CF) has been employed to extract unprecedented information about the Low Energy Constants (LECs) present in EFTs. In particular, the K-Lambda pair CF have been used to constrain the LECs present in our theoretical Model based on the Effective Chiral Lagrangian expanded up to next-to-leading order [1]. More precisely, theoretical CF has been calculated and adjusted to the ALICE data thereby providing novel information of the S=-2 meson-baryon scattering at low energies as well as its intrinsic dynamics that allows the generation of resonances and bound states, from which the molecular nature of Xi(1620) and Xi(1690) can be discussed.

[1] A. Feijoo, V. Valcarce and V. K.Magas, arXiv:2303.01323 [hep-ph].

Collaboration

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Session Classification: Parallel session C5