New experimental limits on the effective hadron interaction with strangeness = -3 by ALICE

June 29, 2021

Abstract

Accessing experimentally the hadron-hadron interactions for systems of various quark content is essential to validate theoretical calculations, first principles and effective models alike. In the case of nucleon-nucleon (NN) interactions scattering experiments provide good constrains for the theory. However, the nucleon-hyperon (NY) interaction is difficult to access with traditional experimental techniques, and mostly limited to the strangess -1 sector.

Recent results from the ALICE collaboration demonstrated the feasibility of using two-particle correlation techniques to investigate the interaction between pairs containing multi-strangeness. We present measurements in the strangeness -3 sector using the p-Ω^- and the Λ-Ξ^- channels, both studied in high-multiplicity pp collisions at $\sqrt{s} = 13$ TeV with ALICE at the LHC.

We have compared the p-Ω^- interaction to first principle lattice QCD calculations and found that they agree with the measured data if the inelastic channels are neglected. In particular the p-Ω^- system couples to Λ-Ξ^- and the strength of this coupling depends on the strength of the interaction itself. Thus, we have measured the Λ-Ξ^- correlation and compared the results to chiral effective field theory calculations. A shallow Λ-Ξ^- interaction is supported, which is compatible with a weak contribution to the p-Ω^- correlation.