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Novel technique to access the three-body interactions with ALICE at the LHC

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The femtoscopic technique provided insights into the previously experimentally inaccessible strong interaction between hadron pairs, including strangeness or charm. The ALICE Collaboration has, for the first time, extended such measurements to three-hadron and hadron-nucleus systems. Such studies provide a pivotal input to a better understanding of exotic nuclei and three-body dynamics, including genuine three-body interactions. The latter, especially those containing hyperons, constitute an essential ingredient in the calculations of the equation of state of neutron stars.

The measurements of three-hadron correlation functions, including p-p-p, p-p-Λ, p-p-K^+ and p-p-K^- triplets, will be presented in this talk. All results were obtained by analysing high-multiplicity pp collisions at $\sqrt{s}$ = 13 TeV measured by ALICE at the LHC. The three-body effects in these systems were extracted using Kubo's cumulant method by subtracting pair-wise interactions. In the three-baryon case, a non-zero cumulant was observed, providing a hint of the existence of three-body effects. In contrast, such effects were not observed in p-p-K^+ and p-p-K^- systems. Hadron-nucleus correlations, such as p-d and K^+-d systems, also provide access to the three-body dynamics. While effective two-body calculations describe well the experimental K^+-d correlation function, they fail for the p-d system, which can be modelled satisfactorily only if theoretical calculations account for the underlying three-nucleon dynamics.

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