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Hyperon-Nucleon Interaction studies with correlation techniques at the LHC

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Hadrons interact via a residual strong force that is unmeasured for most hadron species. The measurement and quantitative understanding of the strong interaction among hadrons is considered to be one of the frontiers within the standard model of nuclear and particle physics. Scattering experiments and spectroscopy studies of stable and unstable nuclei allowed us to quantify the residual nuclear force among nucleons rather precisely, but for unstable hadrons as baryons containing strange quarks (hyperons) such measurements are extremely difficult. The ALICE collaboration recently demonstrated that by combining excellent particle identification and a momentum correlation analysis method applied to pp and p-Pb collisions at the LHC, it is possible to measure the strong interaction among all hadrons containing strange quarks and protons. The case in point discussed in the recent publication by ALICE concerns the correlation between a proton and the rarest of hyperons: the Omega(sss). The precisely measured proton-Omega correlation clearly evidences an attractive strong interaction among the two hadrons and tests theoretical predictions by first principle calculations based on lattice gauge theory methods for the first time. These measurements open a new avenue in nuclear physics, with the potential of accessing the strong force between any hadron pair. Future perspectives for further interaction studies involving strange baryons in Run 3 and the potential extension to 3-body systems will be discussed.

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