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ALICE at the LHC, neutron stars and indirect dark matter searches

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In recent years, the ALICE Collaboration carried out dedicated measurement campaigns to advance the understanding of the physics of neutron stars and indirect dark matter searches and provided new input for the nuclear physics underlying these astrophysics phenomena. The study of the internal structure of neutron stars relies on the knowledge of two- and three-body strong interaction for hadrons containing light quarks (u, d and s). The study of particle correlations in momentum space (femtoscopy) performed by ALICE provided results with unprecedented precision for the strong interaction between all the hadron pairs of interest for the physics of neutron stars. The measurements of the p-Lambda, p-Sigma, p-Xi, p-phi as well as p-p-p and p-p-Lambda correlations will be discussed in the context of the equation of state of neutron stars containing nucleons and strange hadrons.
The second research area connected to astrophysics focuses on the study of the formation mechanisms of light antinuclei and their interaction with ordinary matter. Indeed, antinuclei can either be produced by high-energy cosmic rays or dark matter annihilations in our galaxy and the indirect dark matter searches need a microscopic understanding of the antinuclei properties which can be studied at accelerators. In this context, we will discuss the differential measurements of antideuterons and antihelium-3 and the study of their annihilation cross sections in the context of antinuclei detection in the Earth's proximity.

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