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Extending the ALICE strong-interaction studies to nuclei: measurement of proton-deuteron correlations in pp collisions at $\sqrt{s} = 13$ TeV

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The large data sample of high-multiplicity pp collisions collected by ALICE allows for the precise measurement of the size of source producing primary hadrons, opening the doors to a study of the interaction of different hadron species using femtoscopy techniques. In this contribution, the momentum correlation between (anti)protons and (anti)deuterons measured in pp collisions at $\sqrt{s} = 13$ TeV with ALICE is presented for the first time. The measured correlation function for (p)p-(d)d pairs is compared with theoretical predictions obtained considering Coulomb and Coulomb plus strong interactions and employing the Lednický-Lyuboshitz model with scattering parameters extracted from traditional scattering experiments for the p-d system. The measured correlation function can not be reproduced by any of the obtained predictions. This deviation can to large extent be interpreted as a demonstration of the late formation time of (anti)deuterons in hadron-hadron collisions. This conclusion is key for the understanding of the production mechanism of light (anti)nuclei, which is an open issue in high-energy physics. It has also important consequences for the study of antinuclei formation in the interstellar medium either from collisions triggered by high-energy cosmic rays or by decays of dark matter particles.

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