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Study of (anti)deuteron production mechanism in proton-proton interactions

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The detection of cosmic-ray antideuterons is a potential breakthrough approach for the identification of dark matter. Antideuterons can also be produced in interactions of abundant primary cosmic-ray particles (mostly protons) with the interstellar medium (mostly hydrogen). However, production of light (anti)nuclei in proton-proton interactions is not very well understood. A better understanding of these mechanisms is needed, which motivates the effort to analyze large data sets from fixed-target experiments. This will help in reducing the uncertainties in antideuteron formation, which will boost cosmic-ray antideuteron searches and their interpretation.

The NA61/SPS Heavy Ion and Neutrino Experiment (NA61/SHINE) is a fixed-target experiment at the CERN SPS, which studies hadron production in hadron-nucleus and nucleus-nucleus collisions for various physics goals. This talk will review the analysis of large data sets of proton-proton interactions from NA61/SHINE. Progress made towards measurement of production cross-section of (anti)deuterons and the deuteron-to-proton ratio as a function of transverse momentum will be shown. The further tuning of current Monte Carlo event generators like EPOS-LHC based on this analysis will be discussed.

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