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Formation of light (anti)nuclei

The production mechanism of light clusters of nucleons, such as deuteron, helium-3, tritium and their antiparticles, in high energy particle collisions has lately attracted an increased attention from both astroparticle and heavy ion communities. The expected low astrophysical background of light antinulei makes them ideal probes for exotic astrophysical processes, such as dark matter annihilations. At the same time, they can be used to measure two-nucleon correlations and density fluctuations in heavy ion collisions, which may shed light on the QCD phase diagram. Motivated by the former, we developed a new coalescence model for light nuclei including both the size of the formation region, which is process dependent, and momentum correlations of the antinucleons in a semi-classical picture. We have employed the model as an afterburner to the event generators Pythia 8 and QGSJET II, and find that the model agrees well with experimental data on antideuteron production in e^+e^- annihilations at LEP and pp collisions at LHC. Moreover, we used the model to estimate the expected flux of antideuteron and antihelium-3 from secondary production and dark matter annihilations in the Galaxy.

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