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Formation of light (anti)deuteron from a coalescence afterburner

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The advent of the LHC as antimatter factory has enabled an unprecedented effort to measure the production of light (anti)nuclei from pp to heavy-ion collisions, providing input for a detailed study of nucleosynthesis in high-energy interactions. However, the production of these bound states is not modelled in commonly used event generators. Yet the detection of cosmic antinuclei is predicted to be a smoking gun of dark matter. To fill this gap, we employed a coalescence afterburner to be used with Monte Carlo generator inputs to model the production of light (anti)nuclei in hadronic interactions on an event-by-event basis.
In this work, event generators such as PYTHIA8.3, tuned to describe (anti)proton yields as measured at the LHC, are used as input to a Wigner function-based coalescence afterburner that forms a nucleus when two or more nucleons are close in phase space, depending on the momentum distribution of the nucleons, the nucleus wave function, and the size of the nucleon emitting source. The results are discussed in comparison to ALICE data and from the perspective of applying the model to estimate the fluxes of cosmic antinuclei for indirect dark matter searches with spaceborne experiments like AMS and GAPS.

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