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Formation models for cosmic ray antinuclei

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The expected low background of light antinuclei, such as antideuteron and antihelium-3, make them ideal detection channels for exotic physics, such as dark matter annihilations. At the same time, their small binding energies and composite structures make them promising probes for the QCD phase diagram in heavy ion collisions. In order to correctly interpret experimental data, however, a solid description of the formation process is needed. This can be achieved using phase space coalescence models based on the Wigner function representation of the produced nuclei states. Here, we discuss topics related to the production of light (anti)nuclei with a focus on its relevance for cosmic ray studies. In particular, we consider the importance of including both two-particle correlations and the size of the formation region on an event-by-event basis when describing the production in small interacting systems, such as e^+e^-, pp, pN and peripheral NN collisions. As such, we review the newly developed WiFunC model (Wigner Functions with Correlations) and comment on its generalisation to larger interacting systems.

Keywords

antinuclei; cosmic ray; coalescence; WiFunC; Wigner function; antideuteron; antihelium; AMS-02; GAPS; heavy ion

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