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Understanding the antideuteron production from $\overline{\Lambda_b}$ decays

Antinuclei detection by space-borne experiments close to Earth has been identified as a smoking gun for dark matter signals. Recently, theoretical efforts were attempted to introduce new channels for antinuclei production from $\overline{\Lambda}_b$ decays. This decay channel was never observed and requires experimental evidence, to which the Large Hadron Collider offers the ideal environment. We present a prediction of the $\overline{\Lambda}_b \rightarrow \bar{\mathrm{d}} + \mathrm{X}$ branching ratio ($\overline{\Lambda}_b$ to antideuterons). Proton-proton collisions at $\sqrt{s} = 13.6$ TeV are simulated using PYTHIA, from which the production of $\overline{\Lambda}_b$ is obtained. State-of-the-art coalescence models are then applied to the antinucleons available in the final state to produce antideuterons. A first estimate of the branching ratio of the $\overline{\Lambda}_b \rightarrow \bar{\mathrm{d}} + \mathrm{X}$ process is obtained, evaluating the feasibility of measuring this new channel at the LHC.

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