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Studying (anti)nucleosynthesis via event-by-event fluctuations at the LHC with ALICE

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The production of light (anti)nuclei in heavy-ion collisions has been extensively studied both experimentally and theoretically. Different phenomenological descriptions of (anti)nucleosynthesis differ in the predicted rapidity range over which the conservation of baryon number is realized. Recent studies of the event-by-event Pearson correlation between the antideuteron and antiproton numbers suggest that the baryon number is conserved over a smaller rapidity range than that observed for ordinary hadrons. These observations can be explained by invoking nuclear coalescence mechanisms, which require small rapidity gaps between the nucleons merging into nuclei. In this contribution, the most recent results obtained by the ALICE Collaboration from the study of antideuteron–antiproton and antideuteron–Λ correlations in Pb–Pb collisions are reported. The antideuteron–antiproton correlation provides a benchmark for (anti)nucleosynthesis models, while the antideuteron–Λ correlation arises from baryon-number conservation in the processes underlying the formation of (anti)nuclei since antideuterons do not contain Λ-baryons, providing a crucial complementary test of the coalescence hypothesis. The presented comparison between experimental results and an extensive array of phenomenological models provides new insights into (anti)nucleosynthesis mechanisms.

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