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Longitudinal Fluctuations in Heavy-Ion Collisions with the ALICE Detector

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Event-by-event pseudorapidity distributions in heavy-ion collisions are sensitive to longitudinal fluctuations. Their shapes can be decomposed using Legendre polynomials, analogous to the Fourier decomposition for anisotropic flow. A longitudinal decomposition for Xe—Xe collisions at $\sqrt{s_{NN}} = 5.44$ TeV and Pb—Pb collisions $\sqrt{s_{NN}} = 5.02$ TeV measured with the ALICE detector is presented for event-by-event pseudorapidity distributions and compared to models. A significant forward-backward asymmetry in the particle production is observed, which is quantified via the first-order coefficient, a_1 , from the longitudinal decomposition. Such an asymmetry shows a breaking of boost invariance, which is assumed in various models that describe the initial state of a heavy-ion collision.

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