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Event-by-event local multiplicity fluctuations in charged particle production at the LHC energies with ALICE

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A hot and dense system formed in heavy-ion collisions can be characterized by studying the scaling behavior of the spatial distributions of the produced particles. In this contribution, we present intermittency analysis of the normalized factorial moments (F_{q}) of the multiplicity distributions of the charged particles produced in Pb–Pb collisions as a function of phase-space resolution. The spatial configurations of the charged particles in two-dimensional (η, φ) phase space are investigated. For a system with scale-invariant dynamical fluctuations due to the characteristic critical behavior near the phase transition, the F_{q} exhibits power-law growth with increasing phase-space resolution, which is a signature of self-similar fluctuations and the fractal structure of the system. The dependence of the fractal dimension D_q on the order parameter q is indicative of the multi-fractal nature of the system. By relating the q^{th}-order F_{q} to the normalized second-order factorial moment (F_2), we extract the scaling exponent (ν), which provides information about the order of the phase transition in the framework of the Ginzburg-Landau theory. The first results of the intermittency analysis show the presence of scale-invariant fluctuations, the multifractal nature of the system, and that ν is independent of p_{T} in the soft p_{T} region. The measurements are also compared with the corresponding results from the AMPT and HIJING models.

Category

Experiment

Collaboration (if applicable)

ALICE

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