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Probing the QGP to hadron-gas phase transition with mean transverse momentum fluctuations with ALICE

Tuesday, 5 September 2023 17:30 (2h 10m)

The study of event-by-event fluctuations of the mean transverse momentum, $\langle p_{\mathrm{T}} \rangle$, could probe the nature of the phase transition and seek evidence for temperature fluctuations. In this talk, event-by-event $\langle p_{\mathrm{T}} \rangle$ and higher order fluctuations of charged particles produced in pp collisions at $\sqrt{s} = 5.02$ TeV, Xe–Xe collisions at $\sqrt{s_{\mathrm{NN}}} = 5.44$ TeV, and Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV are reported as a function of charged-particle multiplicity using the ALICE detector at the LHC.

Non-statistical fluctuations are observed in all collision systems, indicating correlated particle emission. The central Pb–Pb collisions show a significant reduction in the fluctuation compared to the peripheral collisions and are in qualitative agreement with previous measurements in Pb–Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 2.76$ TeV. This effect is discussed in view of radial flow effects and/or the presence of mini-jets. The positive skewness of the $\langle p_{\mathrm{T}} \rangle$ fluctuation, which has been proposed as an essential consequence of the hydrodynamic evolution of the produced fireball in heavy-ion collisions, is observed. The kurtosis is found to decrease with increasing system size and saturates at the Gaussian expectation for most central Pb–Pb collisions. To investigate the impact of jets in the measurement of the $\langle p_{\mathrm{T}} \rangle$ fluctuations, a transverse spherocity study was performed and found that jetty events show higher fluctuations compared to isotropic events. The results are compared with widely used Monte Carlo event generators.

Category

Experiment

Collaboration (if applicable)

ALICE

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