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An innovative approach to control volume fluctuations for studies of critical phenomena in nuclear collisions

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We present an innovative procedure to account for unavoidable contributions from volume (or system size) fluctuations to experimentally measured cumulants of particle multiplicity distributions produced in relativistic nuclear collisions. For the first time we extract participant fluctuations directly from the data used for the fluctuation analysis, i.e., without involving model calculations [1]. To achieve this we exploit a dedicated event-mixing algorithm. Participant fluctuations are extracted by constructing cumulants of multiplicity distributions for different particle species and covariances between all possible pairs of particles. A detailed procedure for evaluating the precision of the method for different experiments, such as STAR at RHIC/BNL and HADES GSI/SIS18 will be discussed. The proposed method is essential for analyzing fluctuation signals at low collision energy, but can be applied at LHC energy as well.

[1] A. Rustamov, R. Holzmann, J. Stroth Nucl.Phys. A 1034 (2023) 122641

Category

Experiment

Collaboration (if applicable)

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