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Bayesian approach for centrality determination in nucleus-nucleus collisions in experiments at the NICA accelerator complex

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One of the priority tasks being solved in the experiments BM@N and MPD at the NICA accelerator complex is to classify events into centrality classes. The centrality procedure allows us to estimate the initial geometry in heavy ion collisions using the relation between the observable and the impact parameter. The observable is usually the multiplicity of produced charged particles or the energy of the spectator nucleons [1, 2]. Determining centrality using forward detectors is an important task, as it will suppress the autocorrelation effect in measurements on proton multiplicity fluctuations and can provide an independent approach for centrality determination [3].

In this work, new methods are proposed for centrality determination based on the Bayesian approach using the measured energy of the spectator in the forward hadron calorimeter FHCal. The efficiency of the proposed methods was tested on data from the BM@N experiment for Xe+CsI collisions at a beam energy of 3.8 AGeV and on simulation data for Xe+W collisions at 2.5 AGeV in MPD-FXT. To estimate the accuracy of the proposed methods, the obtained results were compared with the classical approach based on the multiplicity of charged particles and the Glauber model.

References

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