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Cumulants of the multiplicity distributions of identified particles measured in heavy-ion collisions by HADES

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We report on the analysis of event-by-event (E-by-E) fluctuations of protons and light nuclei, in heavy-ion collisions (Au+Au at $\sqrt{s_{NN}} = 2.4$ GeV and Ag+Ag at $\sqrt{s_{NN}} = 2.55$ GeV) measured with the HADES (High-Acceptance Di-Electron Spectrometer) apparatus. The results of various analysis techniques, including cut-based [1], fuzzy logic [2], and machine learning [3], will be presented and compared. Different experimental artifacts, such as contributions from volume/participant fluctuations, will be addressed as well [4, 5]. Finally, efficiency-corrected cumulants of multiplicity distributions will be compared with expectations from non-critical phenomena, i.e., with baselines without critical fluctuations associated with phase transitions between hadronic matter and quark-gluon plasma.

[1] HADES Collaboration, Phys.Rev.C 102 (2020) 2, 024914

[2] A. Rustamov, 2409.09814 [nucl-th]

[3] M. Backes, A. Butter, M. Dunford and B. Malaescu, SciPost Phys.Core 7 (2024) 1, 007

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

[5] R. Holzmann, V. Koch, A. Rustamov, J. Stroth, Nucl.Phys.A 1050 (2024) 122924

Category

Experiment

Collaboration (if applicable)

The HADES Collaboration

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