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Testing new proxies of B, Q and S cumulants in Au-Au collisions at BES energies with EPOS 4

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In the exploration of the nuclear matter phase diagram, the susceptibilities of conserved charges are useful theoretical tools to probe the existence of a 1st order phase transition, and a possible critical endpoint. They can be related to the cumulants of the considered net-charges, for which STAR collaboration recently published experimental measurements of proxies, in Au-Au collisions at several energies of the Beam Energy Scan. Hence, the measured (co)variances of π^\pm , p/\bar{p} and K^\pm are used to build proxy ratios for the corresponding 2nd order cumulant ratios of electric charge Q, baryonic number B and strangeness S.

It is nevertheless important to disentangle the different effects contributing to these net-multiplicity cumulants of hadronic species, in addition to the fluctuations which they are supposed to probe. For this reason, we studied the impact of hadronic cascades on these observables, thanks to complete simulations of Au-Au collisions performed with EPOS 4. The results are compared with cumulant ratios of exact conserved charges, and proposed enhanced proxy ratios based on a study of the hadronic breakdown contributions to the total susceptibilities with IQCD and HRG model calculations.

We show that the use of Λ baryons variance, additionally to σ_π^2 , σ_p^2 and σ_K^2 used by STAR, allow to build proxies that reconstruct quantitatively better the ratios of B, Q and S correlations. Moreover, even if hadronic cascades modify the signal amplitude for all (co)variances, they have little impact on most of their ratios.

Category

Theory

Collaboration (if applicable)

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