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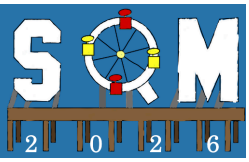

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Freeze-out of charge fluctuations in the QGP: D-measure at the LHC

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The D-measure of net-charge fluctuations quantifies the variance of net charge in strongly interacting matter. It was introduced over 20 years ago as a potential signal of quark-gluon plasma (QGP) in heavy-ion collisions, where it is expected to be suppressed due to the fractional electric charges of quarks. Measurements have been performed at RHIC and LHC, but the conclusion has been elusive in the absence of quantitative calculations for both scenarios.

We address this issue by employing a recently developed formalism of density correlations and incorporate resonance decays, local charge conservation, and experimental kinematic cuts. We find that the hadron gas scenario is in fair agreement with the ALICE data for $\sqrt{s_{NN}}$ = 2.76 TeV Pb–Pb collisions only when a very short rapidity range of local charge conservation is enforced, while the QGP scenario is in excellent agreement with experimental data and largely insensitive to the range of local charge conservation. A Bayesian analysis of the data utilizing different priors yields moderate evidence for the freeze-out of charge fluctuations in the QGP phase relative to hadron gas. The upcoming high-fidelity measurements from LHC Run 2 will serve as a precision test of the two scenarios.

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