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Assessing the QGP speed of sound in ultra-central heavy-ion collisions with ALICE

PONENTE:

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In ultra-central heavy-ion collisions, the volume of the quark-gluon plasma (QGP) is mostly fixed, while the total entropy of the system can vary significantly. At a constant volume, the entropy density, which is itself proportional to the charged-particle multiplicity, can also vary within a few percent, leading to an increase in the temperature of the system and resulting in a rise of the average transverse momentum of the charged hadrons in the final state. This study measures the distributions of charged particles in ultra-central Pb-Pb collisions at $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV. Different centrality estimators based on the number of produced charged particles and the event transverse energy are used to select ultra-central collisions. By ensuring a pseudorapidity gap between the region used to define centrality and the region to perform the measurement, the influence of charged particles from jet production and its potential effects in the rise of the mean transverse momentum is tested. The pronounced rise in mean p_{T} in ultra-central collisions is used to extract the speed of sound. The results are compared with predictions from Trajectum, a hydrodynamic-based model, and QCD-inspired Monte Carlo event generators such as PYTHIA and EPOS-LHC.

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