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Influence of baryon number, strangeness, and electric charge fluctuations on spectra and collective flow at the LHC

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At LHC energies it is possible to generate BSQ (baryon, strangeness, and electric) charge density fluctuations from gluon splittings into quark anti-quark pairs, generated within the ICCING model. This creates an opportunity to implement and quantify the BSQ charge dynamics in the very well controlled regime of heavy ion collisions simulations. In this work, we implement BSQ charge dynamics in a fully integrated framework. We propagate these conserved charges within an upgraded version of the hydrodynamic model, v-USPhydro, that conserves the BSQ charge densities exactly. Our hydrodynamics simulation is informed by the full 4-D equation of state {T,μB,μS,μQ} from Lattice Quantum Chromodynamics and includes decays from the latest Particle Data Group 2016+. We find that we are able to reproduce both spectra and flow in our approach while also obtaining relatively large fluctuations in the chemical potentials {T,μB,μS,μQ} in local fluid cells at the freeze-out hypersurface even at LHC energies. We discuss possible new experimental observables which will be sensitive to these fluctuations of conserved charges.

Category

Theory

Collaboration (if applicable)

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