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Quasiparticle anisotropic hydrodynamics for central collisions

We use quasiparticle anisotropic hydrodynamics to study an azimuthally-symmetric boost-invariant quark-gluon plasma including the effects of both shear and bulk viscosities. In quasiparticle anisotropic hydrodynamics, a single finite-temperature quasiparticle mass is introduced and fit to the lattice data in order to implement a realistic equation of state (EoS). We compare results obtained using the quasiparticle method with the standard method of imposing the EoS in anisotropic hydrodynamics and viscous hydrodynamics. Using these three methods, we extract the primordial particle spectra, total number of charged particles, and average transverse momentum for various values of the shear viscosity to entropy density ratio η/s. We find that the three methods agree well for small shear viscosity to entropy density ratio, η/s, but differ at large η/s, with the standard anisotropic EoS method showing suppressed production at low transverse-momentum compared to the other two methods considered. Finally, we demonstrate explicitly that, when using standard viscous hydrodynamics, the bulk-viscous correction can drive the primordial particle spectra negative at large p_T. Such a behavior is not seen in either anisotropic hydrodynamics approach, irrespective of the value of η/s.

Preferred Track

New Theoretical Developments

Collaboration

Other

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