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Equation of state of strongly interacting matter: spectra for thermal particles and intensity correlation of thermal photons

We find that an equation of state for hot hadronic matter consisting of all baryons having $M < 2$ GeV and all mesons having $M < 1.5$ GeV, along with Hagedorn resonances in thermal and chemical equilibrium, matches rather smoothly with lattice equation of state (p4 action, $N_\tau = 8$) for T up to ≈ 200 MeV, when corrected for the finite volume of hadrons.

Next we construct two equations of state for strongly interacting matter; one, HHL, in which the above is matched to the lattice equation of state at $T = 165$ MeV and the other, HHB, where we match it to a bag model equation of state with critical temperature $T_c = 165$ MeV. We compare particle spectra, thermal photon spectra and histories of evolution of the quark-gluon plasma produced in the central collision of gold (lead) nuclei at RHIC (LHC) energies, considering ideal hydrodynamical expansion of the system. The particle and thermal photon spectra are seen to differ only marginally, for the two equations of state. The history of evolution shows differences in the evolution of temperature and radial velocity, as one might expect.

We calculate intensity interferometry of thermal photons and find it to be quite distinct for the two equations of state, especially for the outward correlation. The longitudinal correlation also shows a dependence on the equation of state, though, to a smaller extent.

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