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Lattice QCD based equation of state at finite baryon density

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The effects of non-zero baryon density are expected to become important in hydrodynamic modeling of heavy collisions below the highest energy at RHIC. Recent calculations in effective models and in QCD using Dyson Schwinger equation suggest that the transition in QCD remains a crossover up to baryon chemical potentials of about 800MeV [1]. If so, the equation of state relevant for hydrodynamic models can be calculated on the lattice using Taylor expansion. However, except for the coefficients of the lowest order, there are large cutoff effects in present lattice calculations for non-zero chemical potentials.

To extend our previous parametrization of the equation of state [2] to finite baryon density, we employ the continuum extrapolated lattice QCD data on Taylor expansion coefficients in order two [3], and complement them with coefficients in order four and six evaluated using p4 action [4]. To avoid large cutoff efects these coefficients are smoothly matched to those of hadron resonance gas at low temperature. Some preliminary results were reported in [5]. We also show how the hydrodynamical evolution is affected by this equation of state in the energy range relevant for SPS and the RHIC energy scan.

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