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Thermodynamics of non-ideal quark gluon plasma using Mayer's cluster expansion method

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This work investigates the applicability of using the Mayer's cluster expansion method to derive the equation of state (EoS) of the quark gluon plasma. The possibility of the existence of quarkonium system after deconfinement at higher temperature than the critical temperature T >Tc is investigated. The EoS has been studied by using cornell potential with the effect of the screening term. It is compared with the theoretical and lattice results and has been done for different number of flavors, nf = 0, 2, 3. The EoS has been studied by calculating second and third cluster integrals using Mathematica program.

Summary

The main advantage of above mentioned method is that we can apply the classical particle picture to the quarks and investigate phase transitions in a QGP. The initial non-ideal gas (the plasma) has been phase transformed to an ideal gas of droplets (two and three particle droplets), where the latter can be considered as a fluid in the sense of gas dynamic theory. This is the mechanism we applied here. The equation of state found here shows the occurrence of heavy quarkonium at Tc = 150 - 200M eV.

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