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Understanding dimensional reduction in finite temperature QCD from spatial string tension and its consequences

Wednesday 5 November 2025 09:00 (20 minutes)

We study some of the outstanding non-perturbative properties of QCD at finite temperature T due to the magnetic gluons whose momenta are $|\vec{p}| \leq g^2 T/\pi$, where g is strong coupling strength. By performing lattice computations of the spatial Wilson line correlators for a wide range of temperatures from 160-1000 MeV on different lattice spacings corresponding to $N_\tau = 8, 12, 16$ for pure SU(3) gauge theory and $N_\tau = 8, 10$ for 2+1 flavor QCD we extract the spatial string tension. From the temperature dependence of the spatial string tension we show that QCD can be described by a dimensional reduced effective theory, EQCD, at temperatures beyond 700 MeV. We further extract the pseudo-potential whose long distance properties are characterized by the spatial string tension and the short distance perturbative part is described within EQCD. We demonstrate how this potential can explain the deviation of the pseudo-scalar and vector screening masses from their perturbative estimates at temperatures as high as 100 GeV. We also derive the spin-spin interaction potential within EQCD and demonstrate how well it can explain the mass splitting between pseudo-scalar and vector screening masses at high temperatures.

Parallel Session (for talks only)

QCD at nonzero temperature and density

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