Contribution ID: **90** Type: **not specified**

Studying the onset of Dimensional Reduction in finite temperature QCD and its consequences

Wednesday 15 January 2025 14:41 (13 minutes)

One of the outstanding challenges in the theory of strong interactions described by Quantum Chromodynamics is to understand its non-perturbative properties which can explain many important phenomena e.g., color confinement. In this work we study the non-perturbative sector of magnetic gluons whose momenta are given by $|\vec{p}| \leq g^2 T/\pi$
in a finite temperature (T) QCD plasma described by strong coupling strength g, both in presence of 2+1 flavors of dynamical quark flavors and without. 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 dimensionally reduced effective theory, EQCD at temperatures beyond 600 MeV. We further extract the pseudo-potential whose long distance part is characterised by the spatial string tension and the short distance perturbative part described within perturbative EQCD. We demonstrate how this potential can explain the deviation of the screening masses of pseudo-scalar and vector meson-like long-distance
excitations of the QCD plasma from the perturbative estimates at high temperatures and provide an explanation for the significant difference between these screening masses that cannot be explained within perturbative QCD.

Primary author: TAH, Swagatam (The Institute of Mathematical Sciences)

Co-authors: BALA, Dibyendu (Bielefeld University); KACZMAREK, Olaf; PETRECZKY, Peter; SHARMA, Sayantan (IMSc)

Presenter: TAH, Swagatam (The Institute of Mathematical Sciences)

Session Classification: Parallel C

Track Classification: 1. QCD Phase Diagram, criticality and fluctuations