

XVth Quark Confinement and the Hadron Spectrum



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Probing the photon emissivity of the quark-gluon plasma without an inverse problem in lattice QCD

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The differential photon emissivity of the QGP is proportional to the transverse channel spectral function $\sigma(\omega)$ at lightlike kinematics.

Estimating the full energy-differential photon emissivity of a medium at thermal equilibrium from lattice QCD poses a challenge, as it involves a numerically ill-posed inverse problem. However, energy-integrated information on the photon emissivity can be obtained without confronting an inverse problem utilizing spatially transverse Euclidean correlators $H_E(\omega_n)$ evaluated at imaginary spatial momenta.

Employing two flavors of $\mathcal{O}(a)$ -improved Wilson fermions, we have performed measurements with very high statistics using stochastic wall sources. For this study, we are using three ensembles with lattice spacings in the range of 0.033 – 0.049 fm, thus allowing for a continuum extrapolation of the first two energy-moments $\sigma(\omega)/\omega$ at a fixed temperature $T \approx 254$ MeV.

As the inserted momenta needed for the second energy-moment are of $\mathcal{O}(3$ GeV), one faces a severe signal-to-noise problem. In addressing this issue, we have modelled the tail of the integrand with two-state fits and also bound the result from above using a bounding method. This allows for a comparison of the difference $H_E(\omega_2) - H_E(\omega_1)$ to the weak-coupling prediction by Arnold, Moore and Yaffe without the weak-coupling uncertainties associated with the very soft photons.

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