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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 $\mathcal{O}(3\,\text{GeV})$, one faces a severe signal-to-noise problem. In adressing 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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