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AdS/CFT predictions for partonic and fragmented momentum, azimuthal, and rapidity correlations of heavy flavors in pA and AA collisions

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We compute the suppression, angular, and rapidity distribution of single open heavy flavour and the momentum, angular, and rapidity correlations for pairs of open heavy flavour in pA and AA collisions at RHIC and LHC from an AdS/CFT-based energy loss model. We quantitatively compare the strongly-coupled QGP predictions for AA collisions to the weakly-coupled QGP predictions of Nahrgang et al.

When restricted to leading order production processes, we predict similar angular correlations for open heavy flavour pairs in a strongly coupled plasma and a weakly coupled plasma, but with an order of magnitude difference in the low momentum momentum correlations. We find that the difference in momentum correlations from the AdS model compared to the pQCD model is, surprisingly, due to tighter momentum correlations in the AdS model than the pQCD model.

When initialised at next-to-leading order (aMC@NLO matched to Herwig++), we observe significant additional broadening of azimuthal correlations. However, the momentum correlations remain even when NLO production mechanisms are included. Thus, our conclusion for differences in momentum correlations with leading order production processes should carry over to next-to-leading order production processes once comparable predictions for a weakly-coupled QGP emerge.

We then show quantitative agreement between all measured high momentum open heavy flavour observables in AA collisions at RHIC & LHC and predictions from this new NLO production plus AdS energy loss model using a recent AdS derivation for the spectrum of momentum fluctuations. Finally, we present first results from this model for open heavy flavour observables in p+A collisions.

Content type

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