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Global constraint on the jet transport coefficient via jet quenching observables in heavy-ion collisions

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The suppression of large transverse momentum (p_{T}) hadrons and the yield of dihadrons and γ-hadrons in relativistic heavy-ion collisions is a direct consequence of the parton energy loss induced by parton-medium interactions, whose strength is described by the jet transport coefficient $\hat{q}$ of the quark-gluon plasma (QGP). Because dihadrons and γ-hadrons have different geometric bias than single-hadron suppression, they probe different regions of the QGP and are sensitive to $\hat{q}(T)$ in different temperature (T) regimes. We carry out the first global Bayesian constraint on the jet transport coefficient using a next-to-leading order pQCD parton model with higher-twist parton energy loss, combining experimental data of single-hadron, dihadron and γ-hadron suppression at both RHIC and LHC energies with a wide range of centralities.

Summary

The combined global Bayesian analysis with the information field (IF) approach produces a stringent constraint on the jet transport coefficient $\hat{q}(T)$ with a strong temperature dependence. Especially, we demonstrate the progressive constraining power on the temperature depednence of $\hat{q}$ using data from different centralities, beam energies and discussed the advantage of using both inclusive and correlation observables. The results can describe the global data on the suppression of single inclusive, dihadron and γ-hadron spectra as well as the elliptic anisotropy v_2 of large p_{T} single inclusive hadrons.

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