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Bayesian analysis of QGP jet transport using multi-scale modeling applied to inclusive hadron and reconstructed jet data

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The JETSCAPE Collaboration reports a new determination of jet transport coefficients in the Quark-Gluon Plasma, using both reconstructed jet and hadron data measured at RHIC and the LHC. The JETSCAPE framework incorporates detailed modeling of the dynamical evolution of the QGP; a multi-stage theoretical approach to in-medium jet evolution and medium response; and Bayesian inference for quantitative comparison of model calculations and data. The multi-stage framework incorporates multiple models to cover a broad range in scale of the in-medium parton shower evolution, with dynamical choice of model that depends on the current virtuality or energy of the parton.

We will discuss the physics of the multi-stage modeling, and then present a new Bayesian analysis incorporating it. This analysis extends the recently published JETSCAPE determination of the jet transport parameter $\hat{q}$ that was based solely on inclusive hadron suppression data [1], by incorporating reconstructed jet measurements of quenching. We explore the functional dependence of jet transport coefficients on QGP temperature and jet energy and virtuality, and report the consistency and tensions found for current jet quenching modeling with hadron and reconstructed jet data over a wide range in kinematics and $\sqrt{s}$. This analysis represents the next step in the program of comprehensive analysis of jet quenching phenomenology and its constraint of properties of the QGP.

[1] JETSCAPE Collaboration (S. Cao et al.), Phys. Rev. C104 (2021) 1, 024905

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