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Heavy quarks probe the equation of state of QCD matter in heavy-ion collisions

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We show for the first time that heavy flavor quenching and flow can be utilized to probe the equation of state (EoS) of quark-gluon plasma (QGP) produced in relativistic heavy-ion collisions. Based on our quasi-particle linear Boltzmann transport (QLBT) model that is coupled to a (3+1)-dimensional viscous hydrodynamic simulation of the QGP and a hybrid fragmentation-coalescence approach for heavy flavor hadronization, we perform a detailed analysis on the D meson R_{AA} and v_2 data at RHIC and the LHC using the state-of-the-art Bayesian statistical framework. A simultaneous constraint on the QGP EoS and the heavy quark transport coefficient is achieved, both consistent with the lattice QCD results.

[1] Feng-Lei Liu, Wen-Jing Xing, Xiang-Yu Wu, Guang-You Qin, Shanshan Cao, Xin-Nian Wang, Eur.Phys.J.C 82 (2022) 4, 350.

[2] Feng-Lei Liu, Xiang-Yu Wu, Shanshan Cao, Guang-You Qin, Xin-Nian Wang, to be submitted.

Experiment/Theory

Theory/Phenomenology

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