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Data-driven analysis of the temperature and momentum dependence of the charm quark diffusion coefficient[1] YINGRU XU, Duke Univ, MARLENE NAHRGANG, SUBATECH, UMR 6457, Universite de Nantes, JONAH BERNHARD, Duke University, SHANSHAN CAO, Wayne State University, STEFFEN BASS, Duke University — Heavy quarks (charm and bottom) have been considered as valuable probes of the QGP medium created in heavy-ion collisions. The interaction strength between heavy quarks and the medium, commonly characterized by their diffusion coefficients, is not directly measurable, but can be estimated by comparison between theoretical model calculations and experimental data on observables such as elliptic flow and nuclear modification factor. In this work, we conduct a data-driven model-to-data analysis to systematically and quantitatively study the evolution of heavy quarks in the QGP medium. We start by proposing a generalized ansatz for the heavy quark diffusion coefficient, then subsequently calibrate our model calculation to the experimental data utilizing a modern Bayesian analysis. We then are able to extract the functional form (with quantified uncertainties) of the transport coefficients. Our model can simultaneously describe the experimental data of D-meson R_{AA} and v_2 for different collision systems at both RHIC and LHC, utilizing our extracted diffusion coefficients. It is found that the heavy quark spatial diffusion coefficient has a non-trivial temperature dependence at low momentum and converges to the pQCD calculation in the intermediate/high momentum region.

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