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# Flavor hierarchy of parton energy loss in quark-gluon plasma from a Bayesian analysis

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The quenching of light and heavy flavor hadrons in relativistic heavy-ion collisions probes the color and flavor dependences of parton energy loss through a color-deconfined quark-gluon plasma (QGP), and thus offers an important test of QCD-based calculation at extremely high density and temperature. By combining a next-to-leading order perturbative QCD calculation of parton production, a general ansatz of parton energy loss functions and parton fragmentation functions, we calculate the nuclear modification of various hadron species – charged hadrons, $D$ mesons and $B$-decayed $J/\psi$ – over a wide transverse momentum regime. Comparing our calculations to the experimental data using the Bayesian statistical analysis, we perform a first simultaneous extraction of the energy loss functions of gluons ($g$), light quarks ($q$), charm quarks ($c$) and bottom quarks ($b$) inside the QGP. We find that the average parton energy loss at high energies follows the expected hierarchy of $\langle\Delta E_g\rangle > \langle\Delta E_q\rangle \sim \langle\Delta E_c\rangle > \langle\Delta E_b\rangle$, while the parton energy loss distribution can further test the QCD calculations of parton interaction with the dense nuclear matter.
We also find that the reduction of experimental uncertainties can significantly improve the precision of the extracted parton energy loss functions inside the QGP.

[1] Wen-Jing Xing, Shanshan Cao and Guang-You Qin, Phys.Lett.B 850 (2024) 138523,arXiv:2303.12485
[2] Wen-Jing Xing, Shanshan Cao, Guang-You Qin and Hongxi Xing,Phys.Lett.B 805 (2020) 135424, arXiv:1906.00413

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