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AdS/CFT heavy-quark energy loss beyond the leading order

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We present new predictions for the suppression of heavy quark decay products at RHIC and LHC from a NLO AdS/CFT energy loss model. Previous predictions from a tomographic model based on only the leading order AdS/CFT contribution to energy loss and constrained by RHIC data disagreed with LHC D meson measurements. In this work we include for the first time a correct treatment of the momentum fluctuations induced in the heavy quark motion from the strongly-coupled thermal medium: we resolve the ambiguity in the evaluation of the stochastic Langevin equations using the Wong-Zakai theorem and properly take into account the fluctuations' deviations from the Einstein relations. The addition of the fluctuations leads to corrections to the suppression predictions, which are significant for charm quarks and their decay products. We demonstrate how further experimental measurements can provide insight into the dominant energy loss mechanisms in, and hence the physical properties of, the quark-gluon plasma produced in heavy ion collisions.

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