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Holographic Heavy Quark Energy Loss in the Hybrid Model

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To date, holographic calculations have provided separate descriptions for the rates of energy loss either for ultrarelativistic massless quarks and gluons or for infinitely massive quarks in strongly coupled plasma, with the latter calculation valid for $\sqrt{\gamma} < M/(\sqrt{\lambda}T)$, where γ is the Lorentz boost factor for a heavy quark with velocity v and mass M moving through plasma with 't Hooft coupling λ and temperature T. These two calculations should apply sequentially in the description of the energy loss of a heavy quark that starts out ultrarelativistic, loses energy, slows down, becomes non-relativistic at later times, and ultimately comes to rest and diffuses in the strongly coupled plasma. We provide an ansatz for uniquely incorporating both regimes to give an approximate but unified description of how a heavy quark that is initially ultrarelativistic loses energy all the way until it comes to rest. We implement this ansatz in the Hybrid Strong/Weak Coupling Model. With this new, consistent, treatment of heavy quark energy loss at strong coupling, we confront our predictions for the suppression R_{AA} and azimuthal anisotropies v_2 of B- and D- mesons, as well as B- and D- tagged jets, with available experimental data. Via a new holographic calculation, we also investigate the regimes of validity of the ansatz that we employ.

Category

Theory

Collaboration

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