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Resolution Effects in the Hybrid Strong/Weak Coupling Model

Within the context of a hybrid strong/weak coupling model of jet quenching, we study the consequences of the fact that the plasma produced in a heavy ion collision cannot resolve the substructure of a collimated parton shower within it to arbitrary resolution.
We introduce a screening length parameter, L_{Res}, proportional to the inverse of the local temperature in the plasma, estimating the value of the proportionality constant from both weakly coupled QCD calculations and holographic calculations appropriate in strongly coupled plasma.
We then modify the hybrid model so that when a parton in a jet shower splits, its two offspring are initially treated as unresolved, and are only treated as two separate partons losing energy independently after they are separated by a distance L_{Res}. This modification delays the quenching of partons with intermediate energy, resulting in the survival of more hadrons in the final state with p_T in the several GeV range.
We demonstrate that this effect modifies the jet shapes and jet fragmentations functions, as it makes it more probable for particles carrying a small fraction of the jet energy at larger angles from the jet axis to survive their passage through the quark-gluon plasma.
We analyze the consequences of different choices for the value of the resolution length L_{Res} on both partonic and hadronic jet shapes and fragmentation functions, as well as on missing-p_T observables.
More generally, we discuss the qualitative consequences, and importance, of including the effects of finite resolution.

Preferred Track

Jets and High pT Hadrons

Collaboration

Not applicable

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