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Computing $\hat{q}$ on a quenched SU(3) lattice

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The jet transport coefficient $\hat{q}$ is the leading parameter that controls the modification of hard jets produced in heavy-ion collisions. This coefficient, like other jet coefficients is inherently non-perturbative, and hence, is challenging to compute from first principles. Currently, existing theoretical model to data comparisons require a separate normalization of $\hat{q}$ between RHIC and LHC energies, beyond the obvious T^3 scaling from dimensional arguments. This is known as the jet $\hat{q}$ puzzle. In this talk, we present a pQCD and lattice gauge theory based formulation to study $\hat{q}$ which sheds new light on the non-perturbative nature of $\hat{q}$ and the jet puzzle. For this first attempt, we formulate $\hat{q}$ within a quenched SU(3) lattice. We consider a leading order diagram for a hard parton passing through the thermal medium. The non-perturbative part is expressed in terms of a non-local (two-point) Field-Strength-Field-Strength operator product which can be Taylor expanded after analytic continuation to the Euclidean region. Such an expansion allowed us to write $\hat{q}$ in terms of the expectation of local operators. We also carry out a perturbative analysis both on the lattice and in continuum field theory to understand the scale dependence of the jet transport coefficient.

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