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The Time Evolution of the Distribution of Matter in Hard Particle Production

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The violent production of a hard, colored object in hadronic collisions causes drastic–but perturbatively calculable–changes to the vacuum. We quantitatively explore this modification of the vacuum produced by strong interactions by explicitly computing the full time and spatial dependence of the QCD energy-momentum tensor associated with a hard production event. The derivation adapts the finite temperature, many-body technology of the Schwinger-Keldysh formalism to scattering problems in perturbative QCD in T = 0 empty space. Applications of our calculation include the creation of a hybrid early-time pQCD/late-time AdS/CFT energy loss model; novel predictions for particle production in high-energy QCD scattering; and new tests of the distribution of matter, energy, and momentum in jets in pp collisions and the redistribution of matter in jets in heavy ion collisions.

On behalf of collaboration:

None

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