

Jet evolution in dense QCD matter

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I discuss the physical picture for the evolution of a high-energy jet in a hot quark-gluon plasma, with emphasis on our latest results on this topic. A complete picture of jet evolution includes both coherent gluon emissions and incoherent emissions. We find a double logarithmic contribution from coherent gluon emissions. The resummation of such leading double logs can be absorbed into a renormalized transport coefficient \hat{q} (the celebrated jet quenching coefficient). Such a radiative correction significantly enhances the value of \hat{q} , with important consequences for the studies of jet quenching in ultra-relativistic heavy-ion collisions. In the second part of my talk, I discuss the jet evolution via incoherent multiple branching and thermalization of the soft branching products. I argue that the following scenario should hold: the leading particle emits a significant number of mini-jets which promptly evolve via multiple branchings and thus degrade into a myriad of soft gluons, with energies of the order of the medium temperature T . Via elastic collisions with the medium constituents, these soft gluons relax to local thermal equilibrium with the plasma over a time scale which is considerably shorter than the typical lifetime of the mini-jet. The thermalized gluons form a tail which lags behind the hard components of the jet.

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