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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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