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Vacuum-like jet fragmentation in a dense QCD medium

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A main difficulty in understanding the dynamics of jets produced in the high-density environment of ultra-relativistic heavy ion collision, is to provide a unified description for the two sources of radiation that are a priori expected: the "vacuum-like" emissions responsible for the parton shower from large virtualities (of the order of the hard scale) down to the hadronisation scale and the "medium-induced" emissions responsible for the energy loss by the jet.

Within this talk, which is based on the recent paper [1], we demonstrate that these two mechanisms can be factorized from each other within a controlled, "double-logarithmic", approximation in perturbative QCD. We show that, due to the scatterings off the plasma, the in-medium parton showers differ from the vacuum ones in two crucial aspects: their phase-space is reduced and the first emission outside the medium can violate angular ordering. We compute the jet fragmentation function and find results in qualitative agreement with measurements at the LHC.

We also present our first results going beyond the double logarithmic approximation, which include both vacuum-like and medium-induced emissions and allow us to estimate the energy loss by the jet.

[1] P. Caucal, E. Iancu, A.H. Mueller, G. Soyez, e-Print: arXiv:1801.09703 [hep-ph], Phys.Rev.Lett. 120 (2018) 232001

Summary

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