Implementing the Landau-Pomeranchuk-Migdal (LPM) effect in a parton cascade.

Content :

Recent data from the Relativistic Heavy-Ion Collider (RHIC) at Brookhaven have provided strong evidence for the existence of a transient Quark-Gluon-Plasma (QGP) with the properties of a near ideal fluid and high opacity.
The discovery of the QGP has been anchored by the measurement of elliptic flow and the suppression of particles with high transverse momentum, jet quenching.

Even though the phenomenon is being referred to as "jet-quenching", the overwhelming majority of computations of this effect have focused on the leading particle of the jet and do not take the evolution of the radiated quanta into account. Recently, with the advent of sophisticated experimental techniques for the reconstruction of full jets emitted from an ultra-relativistic heavy-ion collision, attention has shifted from leading particle energy-loss to the evolution of medium-modified jets. The study of the evolution of the entire jet in the medium is expected to lead to a better understanding of the dynamics of energy-deposition into medium and of the subsequent medium response, e.g. the possible formation of Mach-cones etc.

Parton Cascade Models (PCM [1,2]), which describe the full time-evolution of a system of quarks and gluons using pQCD interactions are ideally suited for the description of jet production, including the emission, evolution and energy-loss of the full parton shower in a hot and dense QCD medium. The Landau-Pomeranchuk-Migdal (LPM) effect, the quantum interference of parton wave functions due to repeated scatterings against the background medium, is likely the dominant in-medium effect affecting jet suppression. We have implemented a probabilistic implementation of the LPM effect [3] within the PCM which can be validated against previously derived analytical calculations [4]. In addition to the analytic validation, we will present first infinite matter calculations of the full jet evolution in medium with the LPM effect.

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