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Towards a yoctosecond imaging tool of the Quark-Gluon Plasma

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Jets are abundantly produced in collider experiments and they allow for stringent tests of QCD, given that their evolution spans a wide range of scales - from the initial hard scale of the collision to the hadronic scale at which they are detected. When jets are produced in the presence of the Quark-Gluon Plasma which they propagate through, as in heavy ion collisions, this range of scales allows them to be sensitive to the QGP at different timescales. My PhD research aims to endow jets produced in heavy-ion collisions with the ability to serve as yoctosecond-resolution probes of the QGP time evolution.
As a first step towards this goal, an exploration of the Q_{AA}, an observable based on matching probability quantiles between jet transverse momentum (p_T) spectra, is made. This observable is a proxy for medium-induced jet energy loss as a function of p_T and presents an alternative to jet modification studies that compare jet properties in heavy-ion and in proton-proton collisions at the same reconstructed p_T. Its advantage lies in it significantly mitigating biases caused by migration of jets from higher to lower transverse momentum, an effect inevitably convoluted with usual studies. By deconvoluting this effect, conclusions about energy loss mechanisms lie on more firm ground. This presentation goes through an analysis of the behaviour of the Q_{AA} with jet radius and how this behaviour is changed when one includes medium response, an integral part of the measured jet whose importance is non-negligible in jet quenching studies.

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