Contribution ID: **49** Type: **Talk**

Unbiased quantification of jet energy loss

Thursday, 1 August 2024 10:20 (20 minutes)

The modifications imprinted on jets due to their interaction with QGP are assessed by comparing samples of jets produced in AA collisions and pp collisions. The standard procedure for doing so, however, ignores the effect of bin migration, i.e, it compares specific observables for jet populations at the same reconstructed jet transverse momentum (p_T). Since jet p_T is itself modified by interaction with QGP, all such comparisons confound QGP induced modifications with changes that are simply a consequence of comparing jets that started out differently. Brewer et al. [1] introduced a quantile matching procedure that directly estimates average fractional jet energy loss (Q_{AA}) and can thus mitigate this p_T migration effect.
In this work, we present an application of this procedure to establish that the difference between inclusive jet and γ+jet nuclear modification factors (R_{AA}) is dominated by differences in the spectral shape, leaving the colour charge of the jet initiating parton with a lesser role to play in this comparison. Furthermore, we study the evolution of Q_{AA} with jet radius and conclude that fractional energy loss decreases with increasing jet radius when QGP response is accounted for.
We explore additional changes imprinted on the jet spectrum which are unrelated to the presence of QGP. Namely, we show that the isospin and nuclear PDF effects on the jet p_T spectrum are quite sizeable for γ+jet events, confounding even further conclusions about QGP induced jet modifications. An attempt is made at suppressing such effects, thus maximizing the role of quenching as a differentiator between populations of AA and pp jets. Both R_{AA} and Q_{AA} sensitivity to these effects is studied.
Finally, we show the size of the p_T migration correction for a number of observables and we present a detailed protocol of how the quantile procedure can be reliably used experimentally to improve existing observable measurements.

[1] Brewer, J., Milhano, J. G., & Thaler, J. (2019). Sorting out quenched jets. Physical Review Letters, 122(22), 222301.

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Session Classification: Heavy Ions

Track Classification: Heavy Ions