

Lessons from RHIC for the LHC and Vice Versa

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For the past decade, measurements of semi-inclusive single identified particle spectra and two-particle correlations in p-p and A+A collisions at RHIC have produced a treasure trove of results which indicate a suppression of hard-scattered partons in the medium produced in A+A collisions. A suppression $R_{AA} \approx 0.2$ has been measured in the range $5 \leq p_T \leq 20$ GeV/c in central Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV for π^0 [1] and surprisingly for single-electrons from the decay of heavy quarks [2]. Both these results have been confirmed at LHC [3, 4]. Interestingly, in this p_T range the LHC results for pions nearly overlap the RHIC results [5]. Thus, due to the flatter p_T spectrum, the energy loss in the medium at LHC must be larger than at RHIC in this p_T range. New at the LHC are the beautiful measurements of the fractional transverse momentum imbalance A_J of di-jets [6]. When corrected for the large fractional imbalance in p-p collisions required to obtain a clean jet sample in Pb+Pb, the relative fractional jet imbalance in Pb+Pb/p-p for ~ 200 GeV jets becomes smaller [7], a good topic for discussion. This is compared to the same quantity derived at RHIC from two-particle correlations of di-jet fragments, with a trigger π^0 with $p_T \approx 10$ GeV/c, which appear to show a larger fractional jet imbalance in this lower p_T range [7]. Among other lessons learned from RHIC which will be discussed is the need for p-p and p-A (or d-A) comparison data at the same $\sqrt{s_{NN}}$ in the same detector; and how the heavy-ion results may influence the search for the Higgs particle in p-p collisions at the LHC.

References

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