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Nuclear Theory

A study of the correlations between jet quenching observables at RHIC

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Focusing on four types of correlation plots, $R_{\rm AA}$ vs. v_2, $R_{\rm AA}$ vs. $I_{\rm AA}$, $I_{\rm AA}$ vs. $v_2^{I_{\rm AA}}$ and v_2 vs. $v_2^{I_{\rm AA}}$, we demonstrate how the centrality dependence of \emph{correlations} between multiple jet quenching observables provide valuable insight into the energy loss mechanism in a quark-gluon plasma. In particular we find that a qualitative energy loss model gives a good description of $R_{\rm AA}$ vs. v_2 only when we take $\Delta E \sim l^3$ and a medium geometry generated by a model of the Color Glass Condensate. This same $\Delta E \sim l^3$ model also qualitatively describes the trigger p_T dependence of $R_{\rm AA}$ vs. $I_{\rm AA}$ data and makes novel predictions for the centrality dependence for this $R_{\rm AA}$ vs. $I_{\rm AA}$ correlation. Current data suggests, albeit with extremely large uncertainty, that $v_2^{I_{\rm AA}} \gg v_2$, a correlation that is difficult to reproduce in current energy loss models.

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