Constraining the Geometry to Study Jet Energy Loss with 2-particle correlations vs Reaction Plane and "2+1" correlations in PHENIX

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Correlations between two high-pt hadrons provide information on how partons lose energy as they travel through the dense plasma formed at RHIC. In back-to-back jets events, where both partons survive to produce high-pt hadrons, the distribution of hard-scattering locations is likely different than the surface-bias that affects single-particle studies. Hence di-jet correlations can be used to study more of the densest region of the matter formed at RHIC, provide a better understanding of energy loss, and constrain the plasmas properties. Achieving these goals requires that we 1) control the path-length travelled by the partons as much as possible and 2) use di-jet observables that are sensitive to the amount of energy loss of partons.

To vary the path length we measure both the centrality and the trigger particle with respect to reaction. In addition, we require an a high-pt hadron in the back-hemisphere to the trigger particle, i.e. 2+1 particle correlations. We will present how two-particle correlations change as a function of these selection variables, and compare with the baseline p+p results. Our emphasis will be on those observables that are sensitive to the amount of energy loss of partons, e.g., the reduction of the yields for far-side associated hadrons as a function of reaction plane and centrality. We will also show quantities derived from these yields, such as $\hat{x}$, the ratio of the di-jet partons momenta after energy loss, but before fragmentation. This ratio is sensitive to the relative energy loss of the two back-to-back partons in the dense medium.