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Systematic study of energy loss in quark-gluon plasma at RHIC-PHENIX

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The phase transition from hadronic material to quark-gluon plasma (QGP) is a phenomenon that occurs under extreme conditions of high temperature and high density. The QGP causes energy loss of high momentum particles which is observed as a suppression of high momentum hadron production in A+A collisions relative to p+p collisions. PHENIX, one of the relativistic heavy ion collider (RHIC) experiments at Brookhaven National Laboratory, aims to measure various QGP signals from nuclear collision reactions. The study presented in this talk uses PHENIX data to evaluate the energy loss of partons in QGP in various collision systems. We systematically study the energy loss with π^0 s in Au+Au and Cu+Au and Cu+Cu at $\sqrt{s_{NN}}=200$ GeV and charged hadrons in Au+Au at $\sqrt{s_{NN}}=200$ GeV using two quantities, S_{loss} and dp_T . S_{loss} represents the percentage of high p_T hadron momentum loss. Previous studies revealed the the scaling properties of S_{loss} on collision system size. The current study uses S_{loss} to quantify energy loss dependence on path-length and measures dp_T which is the difference in momentum loss between the in-plane and out-of-plane directions. The interpretation of these results and their impact on our understanding of the path-length dependence of energy loss in the QGP will be discussed.

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