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Development of unfolding techniques for dijet measurements in sPHENIX

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The quark-gluon plasma (QGP) is a liquid created in high-energy heavy-ion collisions where quarks and gluons become deconfined. This state allows us to examine the emergent properties of quantum chromodynamics (QCD) under extreme conditions. sPHENIX, a new experiment at RHIC, studies the QGP created in Au-Au collisions and started taking data in 2023. Collimated sprays of particles, called jets, may be created in these collisions, typically in back-to-back (dijet) configurations. These dijets are produced prior to the formation of the QGP and interact with it during their development, losing energy ins a process called "jet quenching"which probes the nature of the QGP. When these dijets do not pass through the same path-length of QGP, the energy loss will be asymmetric. The dijet momentum imbalance (x_J) is defined as the ratio between the sub-leading (second highest energy) jet's energy and the leading (highest energy) jet's energy, and is a useful measure of energy loss. However, dijet measurements are sensitive to the underlying event and detector resolution. To correct for these effects we examine the development and application of Bayesian unfolding techniques on PYTHIA jets embedded into HIJING Au+Au background. Future uses will include implementation on measured dijet distributions in sPHENIX.

Category

Experiment

Collaboration (if applicable)

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