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Measurements of jet yield and acoplanarity using semi-inclusive $\gamma_{\text{dir}}+\text{jet}$ and $\pi^0+\text{jet}$ distributions in $p+p$ and central Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV by STAR

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We report high-statistics measurements of semi-inclusive distributions of charged jets recoiling from high- E_T direct photon (γ_{dir}) and π^0 triggers in $p+p$ and central Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV. In a semi-inclusive approach, event bias is induced solely by the choice of trigger; separately utilizing γ_{dir} and π^0 triggers therefore provides direct comparison of effects due to jet quenching - the suppression of energetic partons due to the energy loss in the Quark-Gluon Plasma (QGP) - for jet populations with different quark/gluon fractions and different in-medium path length distributions. Jets are reconstructed from charged particles using the anti- k_T algorithm with jet resolution parameters $R_{\text{jet}} = 0.2$ and 0.5 . The large uncorrelated background in central Au+Au collisions is removed statistically using a mixed event technique. This enables a jet measurement with well-controlled systematic uncertainties extending to low jet transverse momentum (p_T) and large R_{jet} , which are of particular importance in searching for large-angle jet scattering. We report recoil jet yield and trigger-jet acoplanarity distributions for jets with $p_T > 5$ GeV/c. The comparison of recoil yields in Au+Au and $p+p$ collisions at fixed R_{jet} probes energy loss in heavy-ion collisions, while the comparison of recoil yields for different R_{jet} in Au+Au and $p+p$ collisions probes intra-jet broadening due to jet quenching. The modification of trigger-jet acoplanarity distributions in central Au+Au collisions relative to $p+p$ collisions is sensitive to QGP transport parameters, and can be used to search for evidence of large-angle scattering of jets off of quasi-particles in the QGP. The measured recoil yields and acoplanarity distributions are compared to theoretical calculations.

In-person participation

Yes

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