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The STAR Collaboration observed a $\Delta\phi$ - $\Delta\eta$ correlation of particles associated with a near-side jet in RHIC collisions [1-4]. The correlation exhibits a near-side jet component at $(\Delta\phi, \Delta\eta) \sim (0, 0)$ and a ridge component at $\Delta\phi \sim 0$ with a ridge structure along $\Delta\eta$.

The ridge particles bear characteristics similar to those of inclusive particles. Their $\Delta\phi \sim 0$ correlation with the trigger jet suggests that the ridge particles and the jet are related kinematically. It is therefore reasonable to propose the momentum kick model [5] in which the ridge particles are identified as medium partons which suffer a collision with the jet and acquire a momentum kick q along the jet direction. The yield of the ridge particles associated with the jet will depend on the momentum kick q and the initial parton momentum distribution, parametrized as $dN/dyp_t dp_t d\phi = A \exp\{-y^2/2\sigma_y^2\} \exp\{-\sqrt{m^2 + p_t^2}/T\} / \sqrt{m^2 + p_t^2}$ with a rapidity width parameter σ_y and a temperature parameter T .

Under the action of a jet-parton momentum kick, a peak structure in $\Delta\phi$ arises because (i) the magnitude of the initial transverse momentum p_{ti} is a minimum at $\Delta\phi = 0$, and (ii) the probability distribution of the initial transverse momentum p_{ti} decreases as p_{ti} increases. The width of the $\Delta\phi$ distribution of ridge particles depends on q . The ridge structure along the $\Delta\eta$ direction depends on σ_y and reflects the initial rapidity distribution at the momentum of the jet-parton collision.

We found that a momentum kick $q = 0.8$ GeV, an initial rapidity width $\sigma_y = 5.5$, and an initial temperature $T = 0.47$ GeV give a good description with the ridge part of the experimental data [2] in Fig. 1, where the theoretical momentum kick model results for the ridge part of particle yields are shown as solid curves.

If the momentum kick model is indeed the correct mechanism, the ridge structure associated with the near-side jet holds the fascinating promise as a tool to probe the early parton momentum distribution at the moment of the jet-parton collision, leading to the result that at that instant the parton temperature is slightly higher and the rapidity width substantially greater than corresponding quantities at the end point of the nucleus-nucleus collision [5].

References

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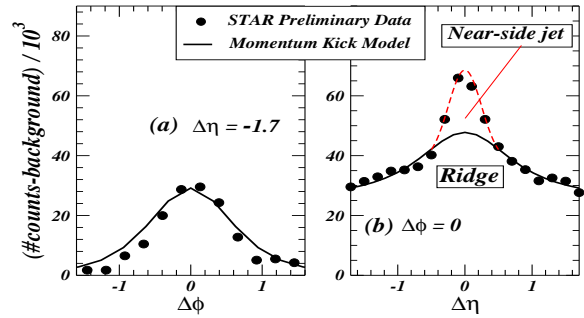


Fig. 1