

Forward $p + p \rightarrow \pi^0 + X$ Production at STAR

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Recent measurements of transverse asymmetries in π meson production have inspired theoretical interest in the subject as a possible means to explore the hitherto unknown transverse spin-structure function, or transversity, of quarks in hadrons. This subject is reviewed in reference [1]. Large single-spin transverse asymmetries for π meson production from polarized proton collisions at large x_F and moderate p_T were measured in fixed target experiments at $\sqrt{s} = 20$ GeV.[2] All perturbative QCD models to date predict the asymmetries to persist up to RHIC collider energies, although they attribute this effect to different dynamics [1]. Experimental results on the unpolarized yield of π^0 mesons and transverse single-spin asymmetries associated with their production at RHIC collider energies may lead to constraints on these models. Preliminary analysis of the production of forward, high-energy π^0 mesons from vertical transversely polarized proton collisions at $\sqrt{s} = 200$ GeV are presented. The data were collected at the STAR experiment in January 2002 during the first year of polarized proton running at RHIC, the first such collisions in a collider environment. The kinematic ranges covered by the data are $x_F \approx 0.3 - 0.6$ and $p_T \approx 1 - 3$ GeV/c. The daughter photons from the decay $\pi^0 \rightarrow \gamma\gamma$ were detected with electromagnetic calorimeters placed at small angles relative to the beam. An electromagnetic Pb-scintillator sampling calorimeter, including preshower and shower-maximum detectors to measure the longitudinal and transverse profile of the photon showers, was placed to beam-left, while arrays of Pb-glass detectors were placed to beam-right, as well as above and below the beam.

References

- [1] V. Barone, A. Drago, and P.G. Ratcliffe, Phys. Rep. **359** (2002) 1. Or see hep-ph/0104283.
- [2] D.L. Adams, et. al., Phys. Lett. B **261** (1991) 201. D.L. Adams, et. al., Phys. Lett. B **264** (1991) 462.