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Beam-Energy and Centrality Dependence of Directed Flow of Λ, $\bar{\Lambda}$, ϕ, K^0_s, $K^{\pm}$, p, $\bar{p}$, $\pi^{\pm}$

Tuesday, 29 September 2015 09:20 (20 minutes)

The Beam Energy Scan (BES) program at the Relativistic Heavy-Ion Collider aims to study the QCD phase diagram in regions where net baryon density is large, a region where a critical point may exist. Possible signatures of a softening of the QCD equation of state have been reported at BES energies, and directed flow (rapidity-odd $v_1(y)$) is one of the more striking examples in this category. This talk will focus on v_1, and its slope dv_1/dy, near midrapidity. Ten identified particle types will be presented: Λ, $\bar{\Lambda}$, ϕ, K^0_s, $K^{\pm}$, p, $\bar{p}$, and $\pi^{\pm}$ produced in Au+Au collisions at $\sqrt{s_{NN}}$ = 7.7, 11.5, 14.5, 19.6, 27 and 39 GeV as a function of rapidity. For Λ, K^0_s, $K^{\pm}$, p and $\pi^{\pm}$, all results are presented in the centrality bins $0-5\%$, $5-10\%$, $10-20\%$, $20-30\%$, $30-40\%$, $40-50\%$, $50-60\%$, $60-70\%$ and $70-80\%$.

At intermediate centrality (10-40\%), dv_1/dy shows a minimum near 14.5 GeV for several particle species while p and Λ also show a sign change. The ϕ meson appears to follow $\bar{p}$ at the higher BES energies, while protons, kaons and pions have a lower magnitude than $\bar{p}$ at 14.5 GeV and above. Λ and p are consistent within errors at all energies. dv_1/dy shows a strong centrality dependence, especially for p and Λ at the lower beam energies. Results for net kaons and net protons will also be discussed.

The UrQMD model shows a qualitatively similar trend for only a subset of the ten particle types under investigation. This comprehensive set of directed flow measurements for several identified baryons, antibaryons and mesons, spanning BES energies and all centralities, offers a powerful constraint on model calculations.

On behalf of collaboration:

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