Mid-rapidity Charged Kaon Ratios in $\sqrt{s_{NN}} = 130$ GeV Au+Au Collisions

C.L. Kunz, M. Kaplan, and N. Xu for the STAR Collaboration*

We report a systematic study of the ratio of charged kaons measured by the STAR experiment for Au+Au collisions at $\sqrt{s_{NN}} = 130$ GeV. The charged kaon ratio is an interesting quantity since it reveals information about strange quark production and chemical equlibration in heavy ion collisions[1]. The two main formation channels for the charged kaons are pair production, $NN \to K^+K^- + NN$ and $NN \to N\Lambda K^+$. However, pair production is expected to dominate in these high energy collisions.

To extract the kaon yields, we constructed a quantity $Z = log([dE/dx]/I(i,\vec{p})$, where $I(i,\vec{p})$ is the expected ionization for a particle of species i and momentum $\vec{p}$. For a pure sample of particle i, this quantity is well described as a Gaussian centered at zero.

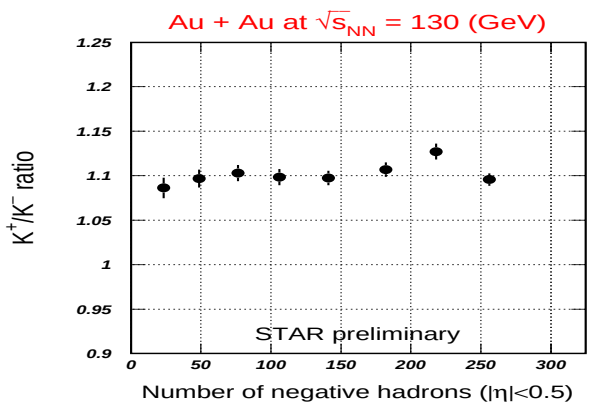

Figure 1: *Mid-rapidity K^+/K^- ratio as a function of number of the negatively charged particles. The data is extracted from the Au+Au collisions at $\sqrt{s_{NN}} = 130$ GeV within ($|y| < 0.4$ and $0.25 < p_t < 0.6$ GeV/c).*

The K^+/K^- ratios are studied as functions of transverse momentum (p_t), rapidity (y), and collision centrality. Within the covered kinematic region, namely, $|y| < 0.4$ and $0.25 < p_t < 0.6$ GeV/c, no dependence is seen as a function of p_t and y. As can be seen in Figure 1, where we plot the ratio versus number of negatively charged particles, the K^+/K^- ratio is also flat as a function of the collisions centrality. This result is consistent with the mid-rapidity anti-proton over proton ratios observed in the same detector[2].

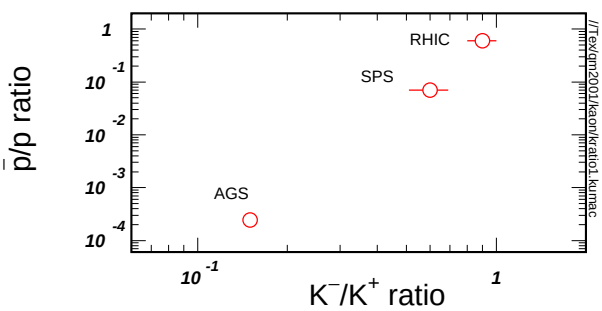

Figure 2: *Mid-rapidity K^+/K^- ratio as a function of collisions energies.*

The flat ratio has several implications: (i) Both K^+ and K^- have similar transverse momentum distributions, meaning they 'flow' together[3]; (ii) The number of net-baryons are small, therefore the influence of the valence quarks are negligible. As shown in Figure 2, the kaon ratios are well correlated with the baryon density (indicated by the $\bar{p}/p$ ratios). As expected, particle production becomes dominant in high energy collisions.

Footnotes and References

*Department of Chemistry, Carnegie Mellon University

[1] J. Cleymans and K. Redlich, Phys. Rev. Lett. **81**, 5284(1998).

[2] C. Adler *et al.* (For the STAR Collaboration), submitted to Phys. Rev. Lett., Dec., 2000

[3] N. Xu, Quark Matter 2001 proceedings, to appear in Nucl. Phys. **A**, (2001).