$\Xi^-+\bar{\Xi}^+$ nuclear modification factor R_{CP} measurement in $^{197}Au+^{197}Au$ collisions at $\sqrt{s_{NN}}$=200GeV

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The measurement of the nuclear modification factor R_{CP} defined by comparing the central and peripheral collisions,

$$R_{CP}(p_T) = \frac{d^2N_{central}/(N_{binary}^{central}dp_T dy)}{d^2N_{peripheral}/(N_{binary}^{peripheral}dp_T dy)}$$

where N is the number of particles per event and N_{binary} is the number of binary nucleon nucleon collisions, is of interest to provide information on hadron production mechanisms in Au+Au collisions at RHIC. Previous measurements [1] have shown a suppression of particle production per number of binary collisions at transverse momenta larger than 2GeV/c from peripheral to central collisions. This suppression is attributed to the energy loss of partons during their propagation through the hot and dense matter. More recent theories argue that if a partonic state exists prior to hadronization, the production of hadrons with transverse momentum up to 5GeV/c should be dominated by coalescence or recombinaison of partons [2,4] rather than fragmentation which may lead to a dependence of R_{CP} on particle type. This particle type dependence has been previously observed for $\Lambda+\bar{\Lambda}$ and K^0_S [1]. R_{CP} for $\Xi^-+\bar{\Xi}^+$ is presented.

The Ξ^- and Ξ^+ are reconstructed via the topology of their decay $\Lambda\rightarrow p+\pi^-$ ($\bar{\Lambda}\rightarrow p+\pi^+$) and $\Xi^-\rightarrow\Lambda+\pi^-$ ($\bar{\Xi}^+\rightarrow\bar{\Lambda}+\pi^+$) using the tracks reconstructed in the STAR projection chamber. Both the momemtum of the daughters tracks and their decay positions were used to reconstruct the invariant mass spectra of Λ and Ξ. A peak around the Ξ mass is clearly distinguished from the background. The raw yields are calculated from the invariant mass distribution by counting the entries within ±13MeV/c² about the expected mass and then substracting the background. The combinatoric background is studied both by rotating the momentum and the position of the Λ ($\bar{\Lambda}$) candidates around the collision vertex by 180° in the transverse plane to the beamline and by sampling two regions on each side of the peak. The Ξ raw yields are then corrected for detector acceptance and reconstruction efficiency for each p_T bin using the Monte Carlo embedding technique.

1.5M central and 1.6M mimimum-bias triggered events are analysed and divided in 5 centrality bins : 0-5%, 10-20%, 20-40%, 40-60% and 60-80%. In fig. 1 we report the nuclear modification factor R_{CP} for $\Xi^-+\bar{\Xi}^+$ derived from the most central (0-5%) normalized to the peripheral (40-60% (top) and 60-80%(bottom)) collisions and compared to $\Lambda+\bar{\Lambda}$ and K^0_S as a function of the transverse momentum.

We note : (i) The Ξ R_{CP}, as the Λ one, continues to increase for p_t > 1.7GeV/c whereas it saturates for the meson K^0_S. This is consistent with the idea of particle type dependence (baryon/meson) proposed by the coalescence and recombinaison models much more than a mass effect. More, the larger R_{CP} ratio for baryons than for mesons indicates that baryon production in this p_T region increases faster than that of mesons with the centrality and thus with the density of the collision fireball.

(ii) R_{CP} for Ξ is quite similar to Λ and p [5] R_{CP} in the intermediate p_T region. This observation suggests that the centrality dependence of the strange quarks dynamics is not so different from the one of the lighest u and d quarks in this p_T region.

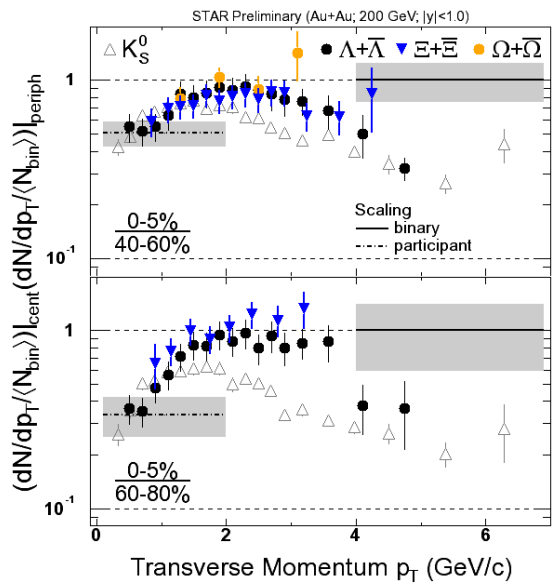

FIG. 1: Nuclear modification factor R_{CP} for $\Xi^-+\bar{\Xi}^+$ compared to the one of $\Lambda+\bar{\Lambda}$ and K^0_S at mid-rapidity (top : 0-5% over 40-60%, bottom : 0-5% over 60-80%). The error bars shown include both statistical and systematic errors.

REFERENCES

[1] C. Adler et al., STAR Collaboration, Phys. Rev. Lett. **92**, 052302 (2004).

[2] D. Molnar and S.A. Voloshin, Phys. Rev. Lett. **91**, 092301 (2003).

[3] V. Greco, C.M. Ko and P. Levai, Phys. Rev. **C68**, 034904 (2003).

[4] R.J. Fries, B. Müller, C. Nonaka and S.A. Bass, Phys. Rev. **C68**, 044902 (2003).

[5] S.S. Adler *et al.*, PHENIX Collaboration, Phys. Rev. **C69**, 034909 (2004)