Λ Hyperons Produced in 158 A GeV Pb+Pb Collisions[G,B]

A.Billmeier[1], C.Blume[2], R.Bramm[1], P.Buncic[1], P.Dinkelaker[1], M.Gaździcki[1], T.Kollegger[1], I.Kraus[1], C.Markert[2], A.Mischke[3], R.Renfordt[1], A.Sandoval[2], H.Sann[2], R.Stock[1], H.Ströbele[1], M.Wensveen[2], A.Wetzler[1], J.Zaranek[1] for the NA49 Collaboration.
[1]Universität Frankfurt, [2]GSI Darmstadt

Most of the Λ hyperons observed in the final state of nucleus-nucleus collisions at SPS energies are truly participating baryons and their rapidity distribution is an appropriate measure of baryon stopping. In addition correlations between Λs probe the Λ-Λ interaction which is the decisive parameter for a possible six-quark bound state, the H-Dibaryon. Finally, the relativ yield of Λ resonances may be compared in p+p and Pb+Pb collisions in order to learn about the differences between in-medium effects of baryons and baryonic resonances. In the past, reconstruction of Λ hyperons proved to be difficult in central Pb+Pb collisions due to the high track density and the resulting confusion when searching for the characteristic V^0 decay topology. Similarily the identification of the $\Lambda(1520)$ excited state by a signal in the (K^-p) invariant mass was hampered by the large combinatorial background. New software improvements in V^0 detection and in particle identification have led to reliable Λ and $\Lambda(1520)$ signals. In this contribution we present new preliminary results on the Λ rapidity distribution in $1.5< y <4.5$, on Λ-Λ correlations and on the comparison of the $\Lambda(1520)$ signal in p+p and central Pb+Pb collisions.

Fig. 1 shows the rapidity distribution of Λs in the 5% most central Pb+Pb collisions. The data are not corrected for feed down from Ξ and Ω decays. Also shown is the published result from experiment WA97 [1] again not corrected for feed down and derived from the 3% most central collisions. It should be noted that the feed down corrections need not to be the same for the NA49 and WA97 analysis. For a comparison of the data to p+p measurements see [2].

In Fig. 2 the Λ-Λ correlation is plotted as a function of the invariant momentum difference (q_{inv}). At low q_{inv} a significant dip signals the Pauli principle for fermions. The absence of a positive correlation at small q_{inv} suggests that the s-wave interaction is rather weak. A fit to the correlation function yields a radius parameter of approximately 2 fm assuming the absence of final state interactions.

Fig. 3 shows the invariant (K^-p) invariant mass distributions after background subtraction for inelastic p+p (upper) and central Pb+Pb (lower) collisions[3]. The $\Lambda(1520)$ resonance is clearly visible in both data samples; their positions are within errors the same and agree with the PDG value. It seems that the width of the $\Lambda(1520)$ from Pb+Pb is slightly broader than from p+p. The yield per participating nucleon pair is slightly lower in the nuclear reaction, although the Λ yield per nucleon pair shows a strong enhancement in A+A over p+p.

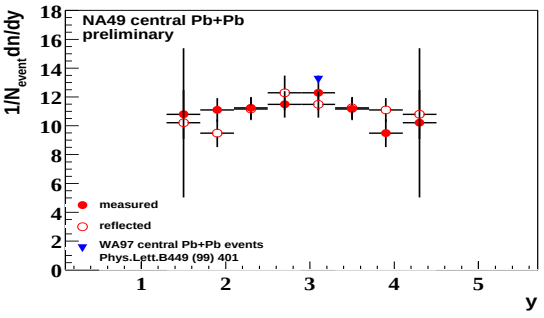

Figure 1: Rapidity distribution of Λ hyperons in central Pb+Pb collisons at 160 GeV per nucleon)

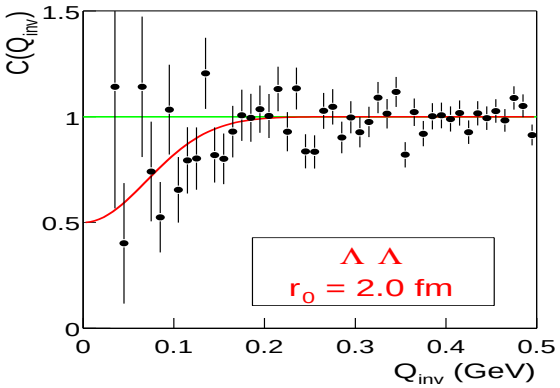

Figure 2: Λ-Λ correlation function from central Pb+Pb collisions.

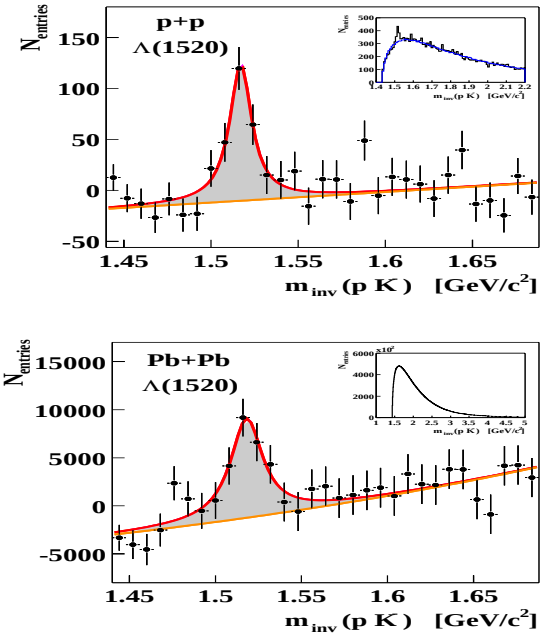

Figure 3: Invariant mass distribution of K^-p pairs in p+p (upper) and central Pb+Pb(lower) collisions at 158 A GeV. The widths of the $\Lambda(1520)$ signals are 15±4 MeV and 23±6 MeV.

References

[1] E. Andersen et al., Phys. Lett B449(99)401
[2] A. Billmeier et al., this GSI Annual Report
[3] C. Markert, PhD Thesis, Universität Frankfurt, 2000