# Ξ and anti-Ξ Production in 158 GeV/Nucleon Pb+Pb Collisions

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Ultra-relativistic nuclear collisions provide a unique opportunity to create and study a hypothetical new phase of nuclear matter: the quark-gluon plasma (QGP). In the color-deconfined QGP phase, a general enhancement of strange-sector particle yields with respect to that from hadronic interactions, has been predicted [1,2]. Multi-strange hyperon production is expected to be particularly sensitive to the rapid flavor equilibration in the early stages of the collisions, when the energy density is highest and the phase transition is most likely [3]. Studies of Ξ and anti-Ξ (S=+/-2) production in Pb+Pb collisions at 158 GeV/c at the CERN SPS were carried out by the NA49 collaboration using two independent analysis techniques: traditional approach, using a magnetic field and direct momentum measurements (Vertex TPC data analysis) and non-magnetic field analysis (data from Main TPC positioned outside magnetic field region)[7]. The lack of charge information in MTPC runs caused by the absence of a magnetic field did not allow a separation between Ξ and anti-Ξ to be made. Thus the sum of Ξ+anti-Ξ was measured with the MTPC. The data presented here were obtained during two different runs, both with a central trigger. The data sample consists of 58K events from the VTPC, and 240K events from the MTPC. Fig.1 shows the invariant-mass distribution for Ξ and anti-Ξ, reconstructed in the VTPC, before background subtraction.

A mass resolution of FWHM=9 MeV for Ξ and FWHM=11 MeV for anti-Ξ was obtained. The background was found to be combinatoric and, depending on cuts, in the range of a few percent in VTPC, and about 20% in MTPC. The analysis of transverse-mass spectra for the Ξ and anti-Ξ (VTPC) and Ξ+anti-Ξ (MTPC) shows that the inverse-slope parameters for Ξ particles in each data set are similar and in the vicinity of 300 MeV. This agrees well with the dependence of the inverse slope T on the particle mass in Pb+Pb collisions established by NA49 measurements [4]. The rapidity density distribution was obtained by integrating the transverse-mass spectra in two rapidity bins. The mid-rapidity multiplicities per unit of rapidity, dN/dy, are 2.29+/-0.12 and 0.5+/-0.05 for Ξ and anti-Ξ, respectively. Quoted errors are statistical only. Making use of reflection symmetry we have systematically investigated Gaussian extrapolations [5] of the rapidity distributions. The resulting estimates of total 4π multiplicities are 8.2+/-1.1 for Ξ+anti-Ξ and 7.4+/-1.0 for Ξ. The Ξ yield per nucleon pair in central Pb+Pb collisions is enhanced by about one order of magnitude, over and above the yield in elementary collisions.

*Footnotes and References*

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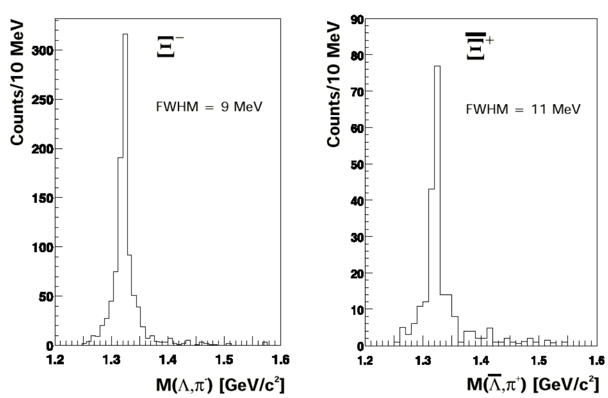


Fig. 1.Invariant mass spectra for Ξ and anti-Ξ..