$\Lambda - p$ **correlation in π^--induced reactions at 1.7 GeV/c** *

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World data for elastic $\Lambda - p$ scattering over a wide range of relative momenta are quite scarce and only available for small beam momenta with a integrated statistic in the order of 200 events [1]. For π^--induced reactions the available data is even more limited [2,3]. In order to improve the theoretical description, new constraints are necessary to parametrize the cross sections. In this context a dedicated π^- + A (A = C, W) experimental campaign was performed at $p_\pi = 1.7$ GeV/c with the HADES detector (SIS18/GSI). The recorded data is analyzed in terms of the inclusive Λ yield and Λ-p correlation. For the reconstruction of the Λ in the inclusive spectra the charged decay channel ($\Lambda \to p\pi^-$, BR = 63.9%) has been examined. Applying topological cuts, an integrated yield of $\sim$11k Λ has been extracted with a purity of 93% ($\pi^- + W$) (Fig. 1). These extracted yields are further corrected for the limited efficiency and acceptance by means of simulations. A Boltzmann distribution has been employed to extrapolated the yield to the full momentum phase space.

After the Λ has been produced it can interact with the nuclear environment and eventually scatter elastically with a nucleon. Thus, events with a matching charge pattern ($\Lambda \to \pi^- p, K^0 \to \pi^+\pi^-, p$) are selected to obtain all kinetic observables. Based on a likelihood-method the particle species has been determined considering the specific energy-loss in the MDCs and velocity β. Since the selected pattern contains two π^- and p in the final state, an event hypothesis has to be applied to assign their corresponding mother particle (Fig. 2, $m_{\pi^+\pi^-} - m_{K^0}$ and $m_{p\pi^-} - m_\Lambda$). The best combination is selected by a simultaneous matching of the invariant mass to the nominal value within the detector resolution. This procedure leads to an extraction of $\sim$6k events in the $\pi^- + W$ system. For a full description of all kinematic properties of the system the Λ before the scattering is reconstructed by the incoming π^--beam and the outgoing K^0.

References

[1] Engelmann et al., Phys. Lett. B19, 715 (1966)

[2] Alexander et al., Phys. Rev. Lett. 7, 348 (1961)

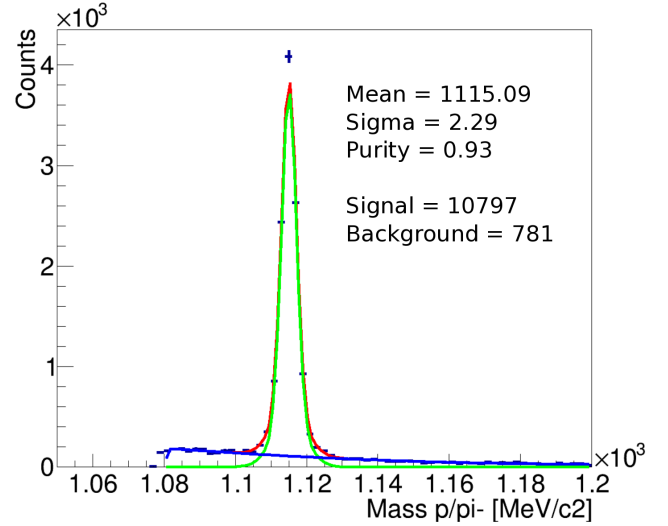[3] Crawford et al., Phys. Rev. Lett. 2, 174 (1959)

Figure 1: Invariant mass spectra of $\pi^- p$ pairs in $\pi^- W$ reactions after the topological have been applied. The signal is fitted with a double Gaussian and the background is described by a polynomial together with a Gaussian.
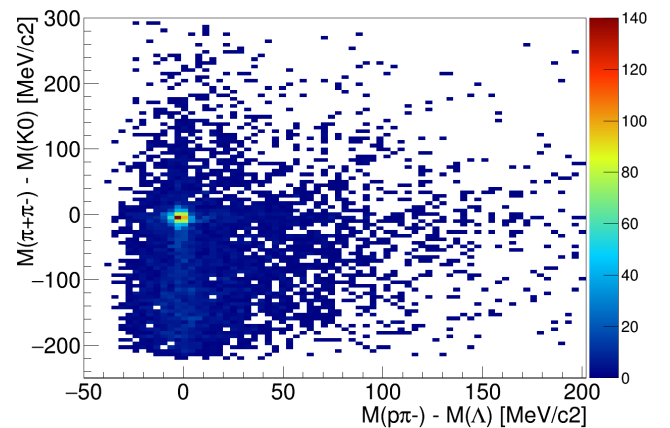

Figure 2: Correlation of the invariant mass spectra of $\pi^+\pi^-$ and $\pi^- p$ for the event pattern $pp\pi^-\pi^-\pi^+$ in $\pi^- W$. The pole mass of Λ and K^0 is subtracted, respectively.