THE $p\Lambda$ FINAL STATE INTERACTION EFFECTS IN THE $p\vec{p} \to K^+\Lambda p$ REACTION AT COSY

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At present, the main features of the $p\Lambda$ interaction in the region 0.1–1.0 GeV/c of laboratory momentum p_Λ are determined. The measured cross sections [1 - 4] are described in the frame of the one-boson-exchange-potential approach [5]. However it is interesting to verify the low–energy $p\Lambda$ amplitude, that is the S- and P-wave effective-range parameters, trying to obtain the experimental information in the range $p_\Lambda \leq 0.1$ GeV/c. One of ways to reach this region is to study the reaction

$$p\vec{p} \to K^+\Lambda p \tag{1}$$

under the kinematics when the final Λ and p are produced near the threshold and at small angles. The constructed 0° facility at COSY (Julich) could give such a possibility. Of course, possible effects in the cross sections and asymmetries will arise due to the rescattering of $p\Lambda$ which complicates the direct investigation of $p\Lambda$ low-energy amplitude since one needs to deal in this case with triangle graphs of final state interaction (FSI). However there is a hope that the above effects will be sensitive to the effective-range parameters and also to the off-shell behavior of the $p\Lambda$ amplitude.

We have considered contributions to the cross sections and asymmetries measured in the reaction (1) which arise from the triangle graphs of $p\Lambda$ FSI as well as from the pole graphs of the one-kaon exchange (OKE) and the one-pion exchange (OPE) which are the main background mechanisms of the FSI. The results for the beam energy 1.65 GeV are shown in Figures. The exclusive cross section $\frac{d^5\sigma}{dp_p d\Omega_p d\Omega_K}$ for the case of $\theta_p = \theta_K = 0°$ is shown in Fig.1 as a function of the proton momentum. It reveals a clear bump at $p_p \approx 0.8$ GeV/c. Dependences plotted in the upper part of this Figure were obtained using the $p\Lambda$ amplitudes of Nagels et al.[5] for two different values of the kaon cut-off parameters. Shown in the lower part are results of calculations in which the effective range parameters obtained by Takahashi et al. [6] were used in the region $0.73 \leq p_p \leq 0.85$ GeV/c ($p_\Lambda \leq 0.1$ GeV/c). The maximum value of the cross section appears to be essentially higher in the last case demonstrating the sensitivity of the cross section to these parameters. The discontinuity in the cross section behavior in this case is explaned by using this set only in the above mentioned region.

In Fig.2 the analyzing power A_z with respect to the longitudinally polarized target is shown. It is equal to zero at the momentum $p_p \approx 0.8$ GeV/c due to the fact that the $p\Lambda$ pair is in the S-state near the threshold. This peculiarity of the analyzing power behavior could be an additional criterion of the $p\Lambda$ FSI dominance in this point. The behavior of the A_z to the right from the point $p_p \approx 0.8$ GeV/c calculated separately for the diagrams with only virtual pions and with only virtual kaons is rather different. It could be the evidence in favor to the one of these both mechanisms.

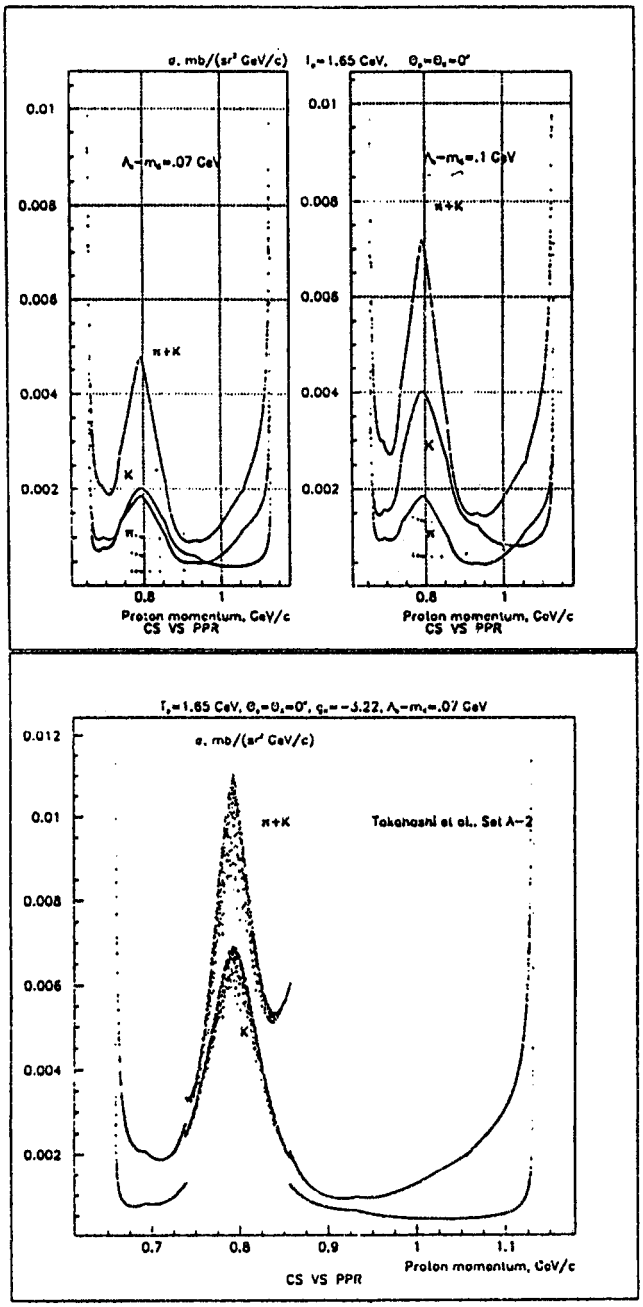

Fig.1. The differential cross section is plotted against the emitted proton momentum. The separate contributions of kaon and pion exchange mechanisms as well as their sum are shown. Two values of kaon cut-off parameter were used. The differential cross section was calculated also with set A-2 of effective range parameters of Takahashi et al. Only for laboratory momenta of lambda less than 100 MeV/c this set was used which explains the discontinuity in the cross section behaviour.

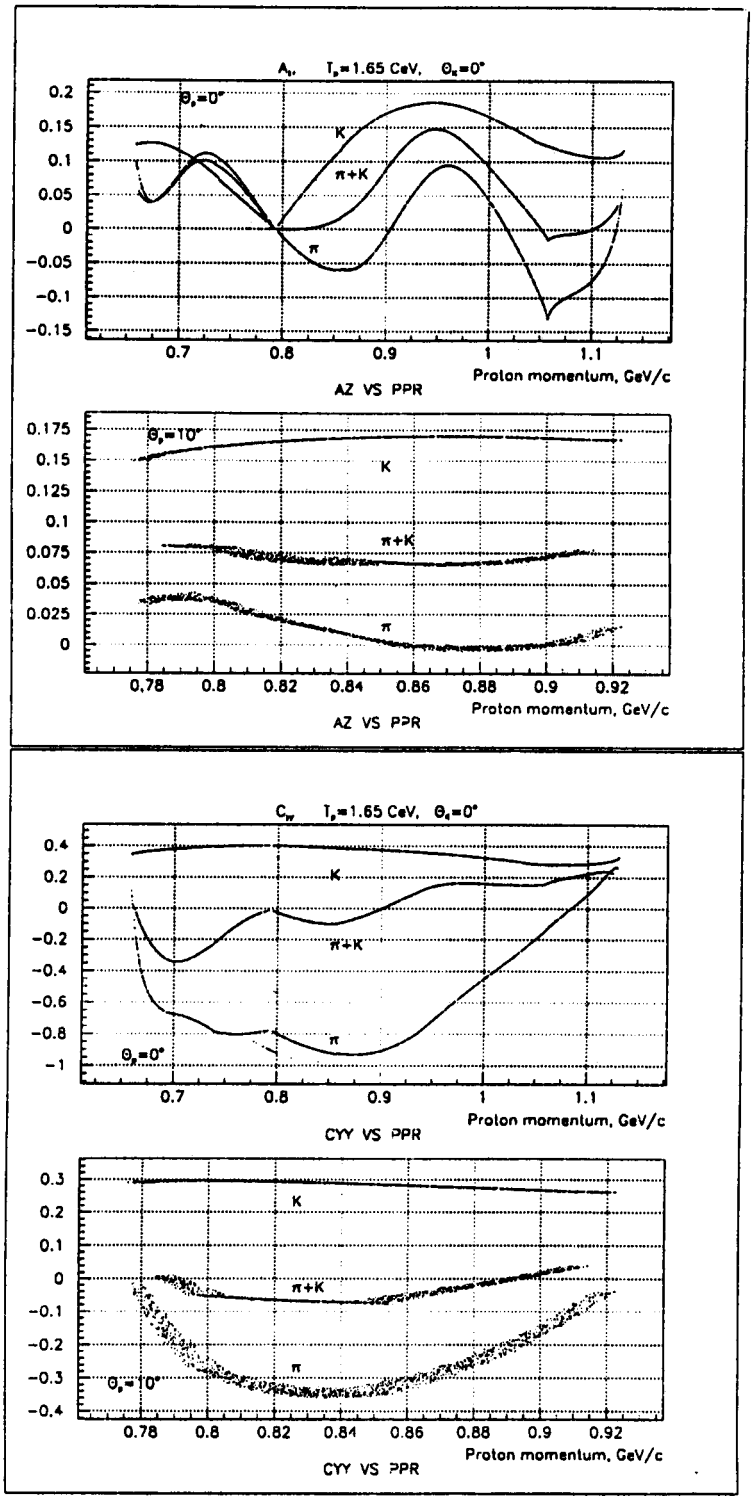

Fig.2. The longitudinal analyzing power A_z and spin correlation parameter C_{yy} are plotted against the emitted proton momentum for different Θ_p

We have considered also the spin correlation parameter C_{yy} of beam and target. As it is seen in Fig.2, this parameter is also not zero for zero degree kinematics and being measured could be very sensitive test for identifying the reaction mechanism.

We hope that these experiments will start in early 1998 when both the polarized proton beam and the polarized proton target are ready.

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