To the Members of the
PAC COSY - Jülich
May 1998

COSY-11 Status Report, 11/97 to 4/98
and
Beam time request for already approved experiments

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Jülich, April 5, 1998

Since the last PAC - meeting in November 1997 the following achievements have been reached:

1. Publications

	Title	Journal
a)	Total Cross Section of the Reaction $pp \to pK^+\Lambda$ Close to Threshold	Phys. Lett. **B** in press
b)	η' Production Close to Threshold in Proton-Proton Scattering	Phys. Rev. Lett. 80 (1998) 3202
c)	Low Energy $\Lambda - p$ Scattering Parameters from the $pp \to pK^+\Lambda$ Reaction	JEP **A** in press

2. Conference Contributions

Members of the COSY-11 collaboration have presented 13 talks at conferences, international workshops and outside collaboration meetings during the time from November 97 to April 98.

3. Diploma - /PhD - Theses

Name	Title	Degree/Location
D. Wyrwa	Analysis of one and two track events in scintillation counters	Diploma University of Cracow December 1997
M. Wolke	Schwellennahe assoziierte Strangeness-Erzeugung in der Reaktion $pp \to ppK^+K^-$ am Experiment COSY-11	PhD University of Bonn January 1998
P. Wüstner	Die Produktion des η-Mesons am Jülicher Beschleuniger COSY und Entwicklung eines optimierten Datenaufnahmesystems	PhD University of Bochum submitted March 1998
G. Schepers	Optimierung des Protonenstrahls für COSY-11 zum Einsatz bei der assoziierten Strangeness-Produktion in der Reaktion $pp \to pK^+\Lambda$	PhD University of Münster scheduled for May 1998

4. Data Taking

Two running periods were approved by the PAC and have been allocated for COSY-11 during the first half of 1998.

4.1. The first run in 2/1998, two weeks for the $pp \to pp\eta'$ reaction.

We studied the reaction: $pp \to pp\eta'$ at Q = 3, 6, 8, 10, 12, and 15 MeV excess energy and measured the excitation function. We got for the first time a stochastically cooled beam. A quasi on-line data evaluation showed the perfect operation of the system.
However, due to a rather limited beam intensity ($N_{beam\ protons} \leq 1 \times 10^{10}$ in COSY) we could not proceed with the planned high statistics run for Dalitz-plot evaluations. (Last November we asked and got approved for this measurement for a running time of 6.5 days (Proposal Exp. No. 11.5).)

Today we ask the PAC for a re-approval of additional time to obtain the necessary high statistics to finish this experiment.
Beamtime request: one week,
COSY-11 priority 2, see the table below (page 6).

4.2. Second run in 3/1998, one week used for $pp \to pK^+Y^0$

In March 1998 COSY-11 was scheduled for a one week run. The original plan was to investigate: "Hyperon production in the pn-induced reactions at COSY-11" (Proposal No. Exp. No. 60).

However, after consulting the chairman of the PAC, Prof. Dr. U. Mosel, we changed our program for the following reasons:

a) the data of our previously performed run on the reaction $pp \to pK^+\Sigma^0$ showed - relative to other beam momenta with excess energies at Q = 3, 5 and 7 MeV - a drastically different missing mass resolution at Q = 10 MeV excess energy, see Fig. 1.

This deterioration could not be explained and is much larger than expected. We were in doubt about these Q = 10 MeV data and wanted to re-measure it.

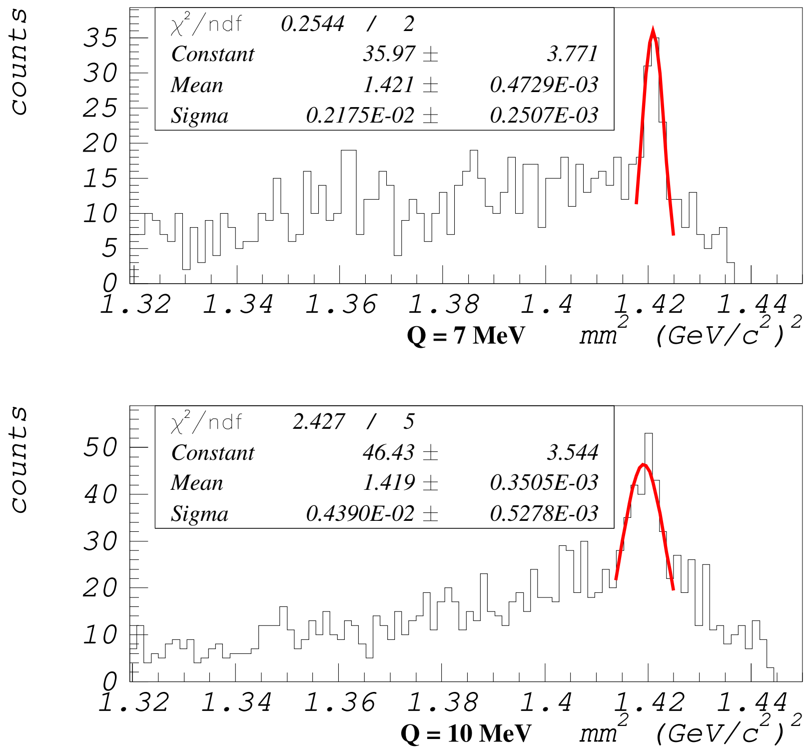

Figure 1.

Missing Mass spectra of the reaction
$pp \to pK^+\Sigma^0$ for two different excess energies,
upper figure Q = 7 MeV with a missing mass resolution of 2.2 MeV/c^2 (FWHM)
lower figure Q = 10 MeV with a missing mass resolution of 4.3 MeV/c^2 (FWHM),
where 2.6 MeV/c^2 (FWHM) was expected.

b) According to two very recent publications [1,2] the ratio of the cross sections $R = \frac{pp \to pK^+\Lambda}{pp \to pK^+\Sigma^0}$ predicted in the threshold region for the same relative excess energy of the two reactions deviates drastically from our preliminary experimental results, see table and Fig. 2.

Comparison of predicted and measured cross section ratio			
excess energy	**theoretical** $R = \frac{pp \to pK^+\Lambda}{pp \to pK^+\Sigma^0}$	**experimental COSY-11 results** $R = \frac{pp \to pK^+\Lambda}{pp \to pK^+\Sigma^0}$ **[PRELIMINARY]**	$\frac{\textbf{experiment}}{\textbf{theory}}$
0 MeV $\to$ 300 MeV	Ref. [1]: $\approx$ 2.7	24 - 38	9 - 14
3 MeV	Ref. [2]: 12	24	2.0
5 MeV	Ref. [2]: 9	31	3.4
7 MeV	Ref. [2]: 7	38	5.4
10 MeV	Ref. [2]: 6	not yet available	

Obviously, the ratios seen by COSY-11 are significantly larger than the theoretical predictions, though the quoted papers do not include final state interactions.
It should be noted here that both the table and the figure indicate a somewhat steeper slope for the $pp \to pK^+\Lambda$ data, and that the cross section at Q = 10 MeV for the $pp \to pK^+\Sigma^0$ data doesn't seem to follow a straight line pattern formed by the cross sections from the measurements at Q = 3, 5 and 7 MeV in the log - log scale of Fig. 2.
Since this physics seemed to us to be a very actual topic, and since we rather wanted to finish a project before starting a new one, and since we had our own doubts about the data (as mentioned above (point a)), we used the one week of beam time in March 1998 for a re-measurement and an extension of the $pp \to pK^+\Lambda(\Sigma^0)$ program.

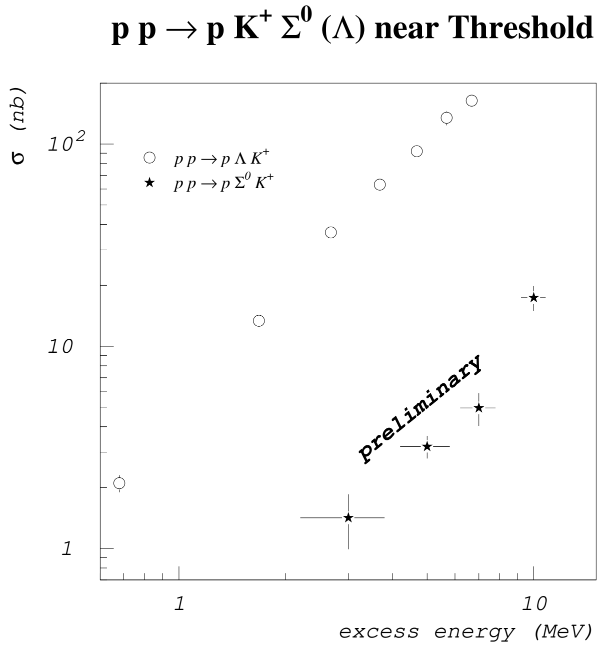

Figure 2. Cross sections for the reactions $pp \to pK^+\Lambda$ (open circles) and $pp \to pK^+\Sigma^0$ (closed stars), measured at COSY-11.

To minimize systematic uncertainties the experiment was performed by running in a supercycle mode as follows: with the same beam optics one spill of five minutes was used for a $pp \to pK^+\Lambda$ measurement followed by ten (twenty) spills of five minutes for a $pp \to pK^+\Sigma^0$ measurement at the same excess energy.

We would be pleased to present preliminary results from this experiment at the forthcoming PAC meeting.

Since the originally proposed measurement for the $pd \to K^+\Lambda pn$ and the $pd \to K^+\Sigma^+ pp$ reactions have not been performed,
we ask the PAC for a re-approval of the beam time for "Hyperon production in the pn-induced reactions at COSY-11"
(Proposal No. Exp. No. 60).
Beamtime request: one week,
COSY-11 priority 3, see the table below (page 6).

5. Beam Time Requests

The COSY-11 collaboration proposes three experiments to be performed, two were mentioned above in this letter and for one we submit an extra proposal to the PAC meeting May 1998, concerning the K^+K^- production in proton-proton scattering, which we assign the highest priority. The following table lists the main parameters:

Beam Time Request COSY-11 for II/1998				
Reaction	**Beam Momentum**	**Time (weeks)**	**Comments**	**COSY-11 Priority**
$pp \to ppK^+K^-$	**3.29 GeV/c - 3.35 GeV/c**	**4**	**new proposal**	**1**
$pp \to pp\eta'$	**3.25 GeV/c**	**1**	**already approved during PAC November '97 meeting**	**2**
Test measurements $pd \to K^+\Lambda pn$ $pd \to K^+\Sigma^-pp$	**1.85 GeV/c** **2.02 GeV/c**	**1**	**already approved during PAC November '97 meeting**	**3**

REFERENCES

1. G.Q. Li, C.M. Ko and W.S. Chung, Phys. Rev. C 57 (1998) 434
2. K. Tsushima, A. Sibirtsev, and A.W. Thomas, preprint nucl-th/9801063, 29 Januar 1998