

NP/73/mk

29.6.1967

Memorandum

To : The E.E.C. and N.P.R.C.
From : C. Daum, F. Ern , J.P. Lagnaux, J.C. Sens, M. Steuer, F. Udo.
Re : Scheduling K^- polarized proton scattering experiment.

In a recent status report (8.5.67) five PS weeks have been requested for completion of a series of measurements, which had been defined as the minimum necessary for an analysis from which one could expect to draw any new conclusions concerning K^-p interactions. In the following EEC meeting, four weeks have been allocated; in addition the allocated weeks were concentrated in a time span of ~ 6 weeks, whereby further data-taking, either as parasite user (sharing with e_3) or as main user (breakdowns in the external beams) - a possibility for which the original schedule did allow - has been excluded.

To date (27.7.67), three of the four allocated weeks have passed. It has become clear that - in spite of our efforts to further increase the production efficiency - we will not be able to complete the minimum programme in the allocated time. The PS performance - after a 27 hour late start following the April/Mai shutdown - has been fluctuating and averaged out to the loss factor, calculated into the estimated 5 weeks.

The question may thus be raised whether it is expedient to dismantle the experiment after completion of the allocated four weeks. The problem would not arise, were it not for the decision to have the $\Xi \beta$ experiment finished before the 1968 shutdown. We do not feel qualified to judge whether or not this goal can be reached; on the other hand it can be said with certainty that both the experiment on the EM decays of vector mesons and the $K^- \text{ pol } p$ experiment are severely limited in their aims by this decision. We would like to suggest therefore that the EEC recognizes

now that the $\Xi(\beta)$ experiment is to continue after the 1968 shutdown - at an estimated 4 x higher rate (2 x for PS rep-rate, 2 x for better K-beams) - so that a more flexible sharing of the #1 time, available until the 1968 shutdown, between the EM decays, Kp and $\Xi(\beta)$ becomes possible.

To substantiate this request for PS time, which will be made more specific below, the following comments may be made.

a) The minimum programme implies taking data every 50 McV/c between 1.4 and 2.4 GeV/c. The momenta 1.85, 2.25 and 2.35 GeV/c will be missing from the list after the 4 weeks are completed.

b) The data acquisition equipment is efficient and reliable. Its performance is regularly checked by computer-feed back and is ready for production on short notice. As an example, upon request from the coordinator to take over as #1 user following an emergency stop in the external beams recently, production could be started two hours after the request was made. The experiment is thus a suitable candidate for any stand-by arrangements that may be necessary.

c) In February 1967 an experiment $K^- \text{pol } p \rightarrow K^- p$ in the region 1.0 - 1.4 GeV/c has been terminated at NIMROD. Fig. 1 shows a comparison on the accuracy reached in the Legendre coefficients of the polarization data (no $\sigma(\mathcal{P})$'s are obtained) with the coefficients at four of the energies of the present CERN experiment. The values given there are not final, but the errors in neither experiment will change much from their indicated values. It is clearly of interest to improve the accuracy of these results, and in particular to measure a new point in the 1.20 - 1.25 GeV/c region which would clarify the behaviour of the D_5 coefficient with energy.

d) As a byproduct of the present experiment $\bar{p} + \text{pol } p$ elastic scattering data ($\sigma(\mathcal{P})$ and $P(\mathcal{P})$) have been obtained at 1.75 and 2.15 GeV/c. The angular distribution shows a dip plus secondary maximum, as in $K^- p$ (but unlike pp); the polarization

curve shows a maximum polarization of $\sim 40\%$ but no reversal of sign in the region of the dip. If confirmed, this would be of considerable interest for a Regge analysis of the data on both K^+p and $\bar{p}p$; at present it is conjectured that the same trajectories (with the same signs) are present in these two reactions.

From the experimental point of view, two features distinguish $\bar{p}p$ from K^+p 1) In the CM angular distribution of $\bar{p}p$ the regions where "elastic" events cannot be distinguished from "reversed elastic" events is strongly reduced with respect to K^+p ; hence the angular distribution is measured twice (once left, once right) and therefore a check on the polarization of the incident \bar{p} beam can be made; 2) The separator is considerably more effective for \bar{p} than for K^+ , due to the larger mass-difference with respect to the pion; hence the data-taking is $\sim 2 - 3$ as fast as with K^+ . The $\sigma(\mathcal{A})$ and $P(\mathcal{A})$ at 1.75 GeV/c have been obtained in ~ 20 hours of PS time. Fig. 2 illustrates a sample of the data and a preliminary analysis.

Without any changes in the apparatus, 2 PS weeks would result in $\sigma(\mathcal{A})$ and $P(\mathcal{A})$ at 10 to 15 momenta between 1.4 and 2.4 GeV/c.

SUMMARY

- 1) We request to remain in stand-by for the months July and August, as indicated on the current PS schedule.
- 2) In case that no or only a fraction of the data could be taken during the stand-by period, we ask to allocate one PS week or a fraction thereof to finish the minimum programme on K^+p .
- 3) We ask to reconsider the scheduling of the m-beam

users up to the shutdown 1 1968. In the event of a redistribution of time among the m-beam users - or an increase of time on target # 1 - we ask for 2 PS weeks to run $\bar{p}p \sigma(\gamma)$ and $P(\gamma)$ at $\sim 10 - 15$ momenta in the 1.4 to 2.4 GeV/c range.

4) One may add that this programme would complete the measurements that can efficiently be done with this apparatus in this beam. In particular, to improve and complete the recent NIMROD data (see c) above), the same apparatus can be used but a very long running time in the m-beam would be required (e.g. 4 days at ~ 1.25 GeV/c). The improved K-beams and increased PS repetition rate foreseen for late 1968 call for postponing data-taking in the 1.0 - 1.4 GeV/c range until then.

○ WHITE
○ CHINA

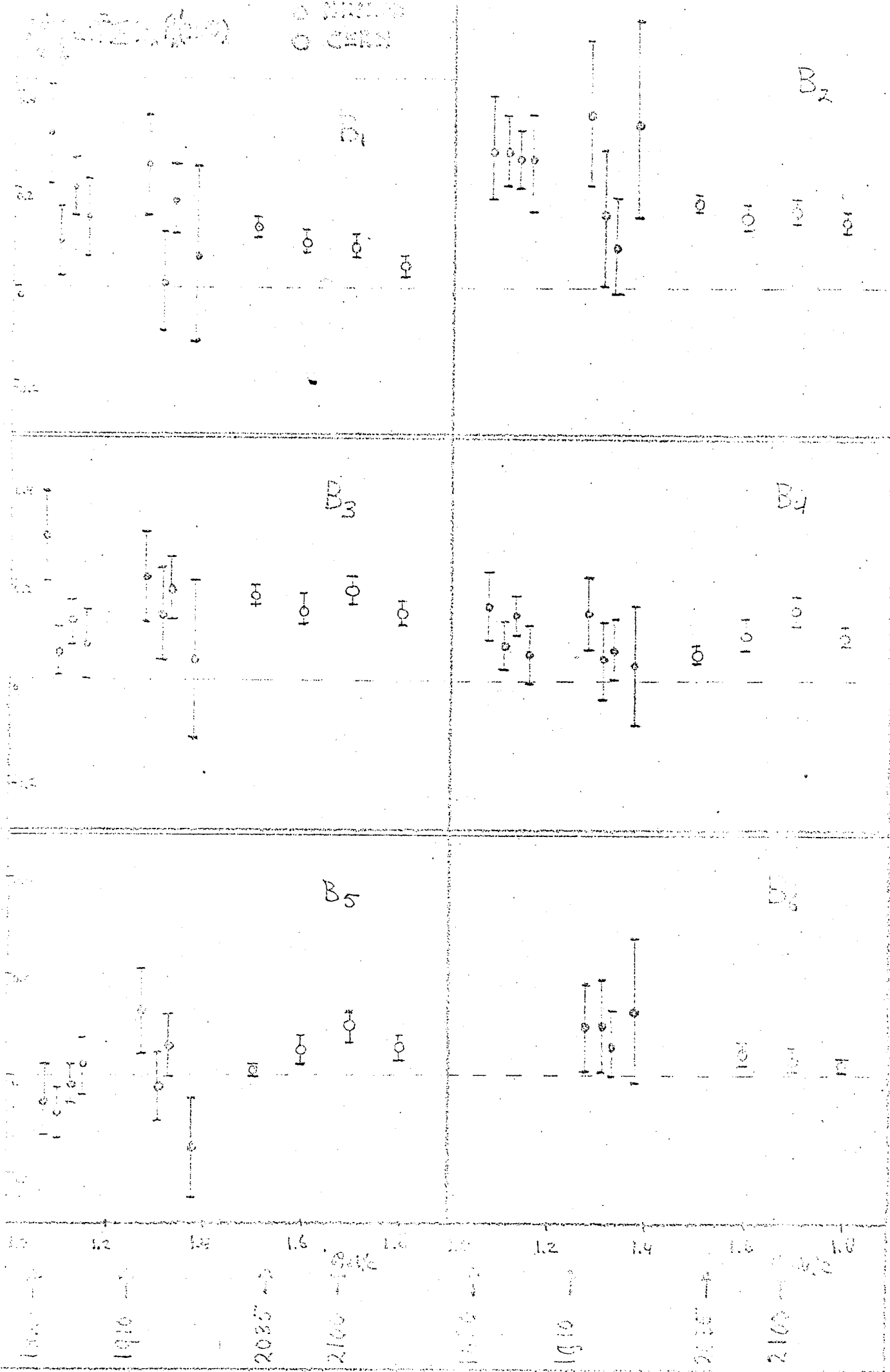
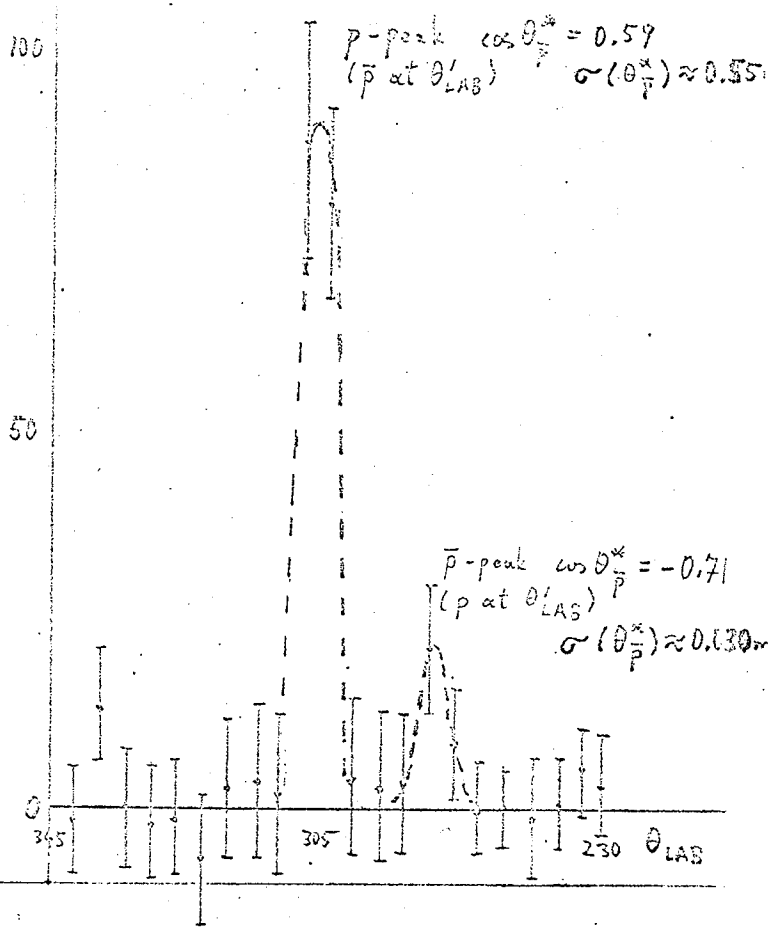
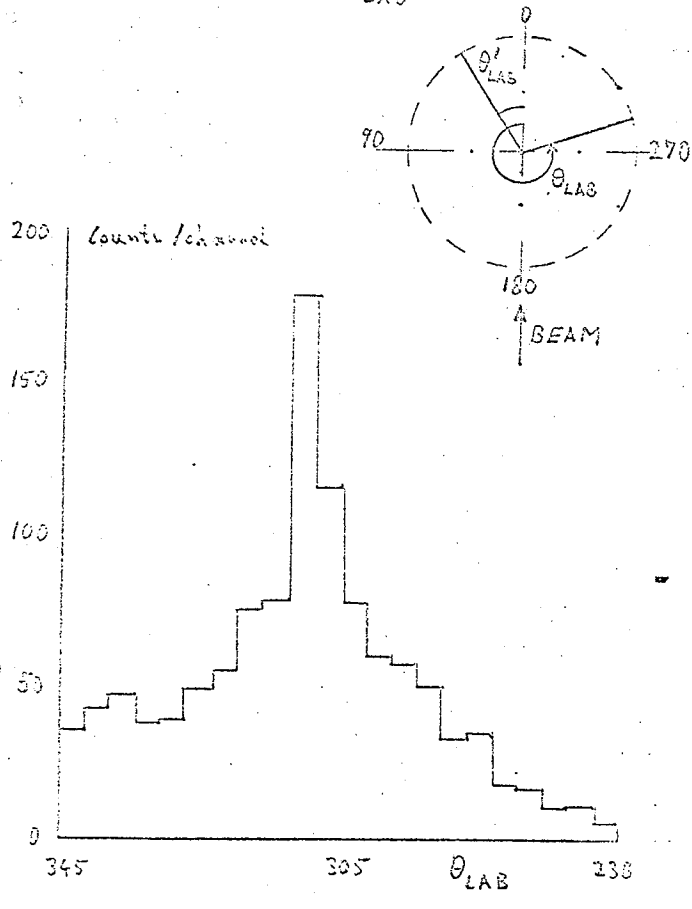


FIG. 1. PRELIMINARY, NOT TO BE QUOTED.

Electronically selected events
for $15.2 < \theta'_{LAB} < 19.5$

Background corrected coplanar events
for $15.2 < \theta'_{LAB} < 19.5$



Angular Distribution

Polarization

