S 67 67/4

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Appendix to LETTER OF INTENTION dated 28th November, 1966

To : Members of the Electronics Experiments Committee

From : C. Bricman*, M. Ferro-Luzzi, J.M. Perreau (CERN)
J. Seguinot, Y. Desclais (Univ. of Caen)
G. Valladas (Saclay).

Re : Counter Experiment on $K^- p \longrightarrow \bar{K}^0 n$ cross section from 1 to 2 GeV/c

In view of the practical problems connected with the scheduling of our experiment within a reasonable time-scale (viz. within the current year), it may be useful to assess in a more critical and detailed way what our machine-time requirements are and what can we expect to achieve under those bounds and with the existing experimental facilities.

The beam envisaged for the experiment is the one known as "m_{4b}". Since other experiments are already planned on this beam, a possibility that has been carefully examined is if we can run in parallel with one of these experiments. The only experiment for which this could be imagined is the one making use of the polarized target. However, in spite of the undeniable advantages of such a symbiosis, it has appeared that the resulting disadvantages are of such importance as to make it practically impossible. The main disadvantages can be summarized as follows:

1. A displacement of our target by $\sim$ 5m downstream is required if the polarized target is to remain in place while we run. This, of course, reduces the K^- flux at our target. The overall time-estimate of the present note would have to be increased by $\sim$ 50 o/o.

2. The constant magnetic field on the polarized target deflects the beam. Our target would have to be geometrically re-aligned for each momentum setting.

3. The optimum conditions for beam-focusing, if satisfied at the first target, would not be so at our target; an appropriate re-adjustment would need new magnets and more space.

4. Finally, the different requirements of beam momentum and running time would introduce conflicts of interest which cannot be resolved except by forcing an unreasonable amount of inefficiency to one or the other experiment.

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PS/5723/jc

Assuming then that we are to run alone and with our target nearest to the beam's last component, the limiting factor on the experiment is the performance of the m_{4b} beam. Information on the latter exists already and is shown in Fig. 1. The curve here indicates the K^- flux as calculated from the beam characteristics; the points are the results of measurements performed in experimental conditions similar to those planned for our experimental apparatus(*). The agreement between points and curve is remarkable; we shall base all further discussion on the fluxes indicated in Fig. 1.

It immediately appears that the fluxes at momenta below ~ 1.5 GeV/c are prohibitively low. This fact, associated to the high and relatively constant flux between ~ 2 and ~ 3 GeV/c, suggests shifting the region of investigation of this first experiment from the 1 - 2 GeV/c interval mentioned in the proposal to a more easily measurable 1.5 - 3 GeV/c interval. The interest of the study remains practically unaltered; the chances of discovering something new are actually enhanced.

Fig. 2 shows the sparse measurements of the $K^- p \longrightarrow \bar{K}^o n$ cross section existing in the region considered. A straightforward calculation based on the K^- fluxes of Fig. 1 and the cross sections of Fig. 2 yields an average ~ 1.5 hrs of running time (with ~ 30 o/o of the machine intensity) in order to count 10^4 reactions of the type $K^- p \longrightarrow \bar{K}^o n$, $\bar{K}^o \longrightarrow K^o_2$. Allowing for twice as much time estimated for empty-target counts and for momentum change-over, the result is that typically ~ 4.5 hrs are needed for one cross section point measured with a statistical uncertainty of ~ 1 o/o and a dP/P of $\sim \pm 1$ o/o. Taking an average momentum step of ~ 40 MeV/c (less at the lower momenta, more at the higher), one obtains a total of ~ 40 cross sections points in ~ 180 hrs. This figure is in substantial agreement with what we quoted in the original proposal. Accounting for an estimated and perhaps pessimistic ~ 70 o/o overall efficiency, we obtain the safe figure of 250 - 300 hrs. This amounts, in practice, to 3 machine-weeks. Let us further add 1 more week to test the apparatus. The final requests adds up to <u>4 machine-weeks</u> (not necessarily in succession).

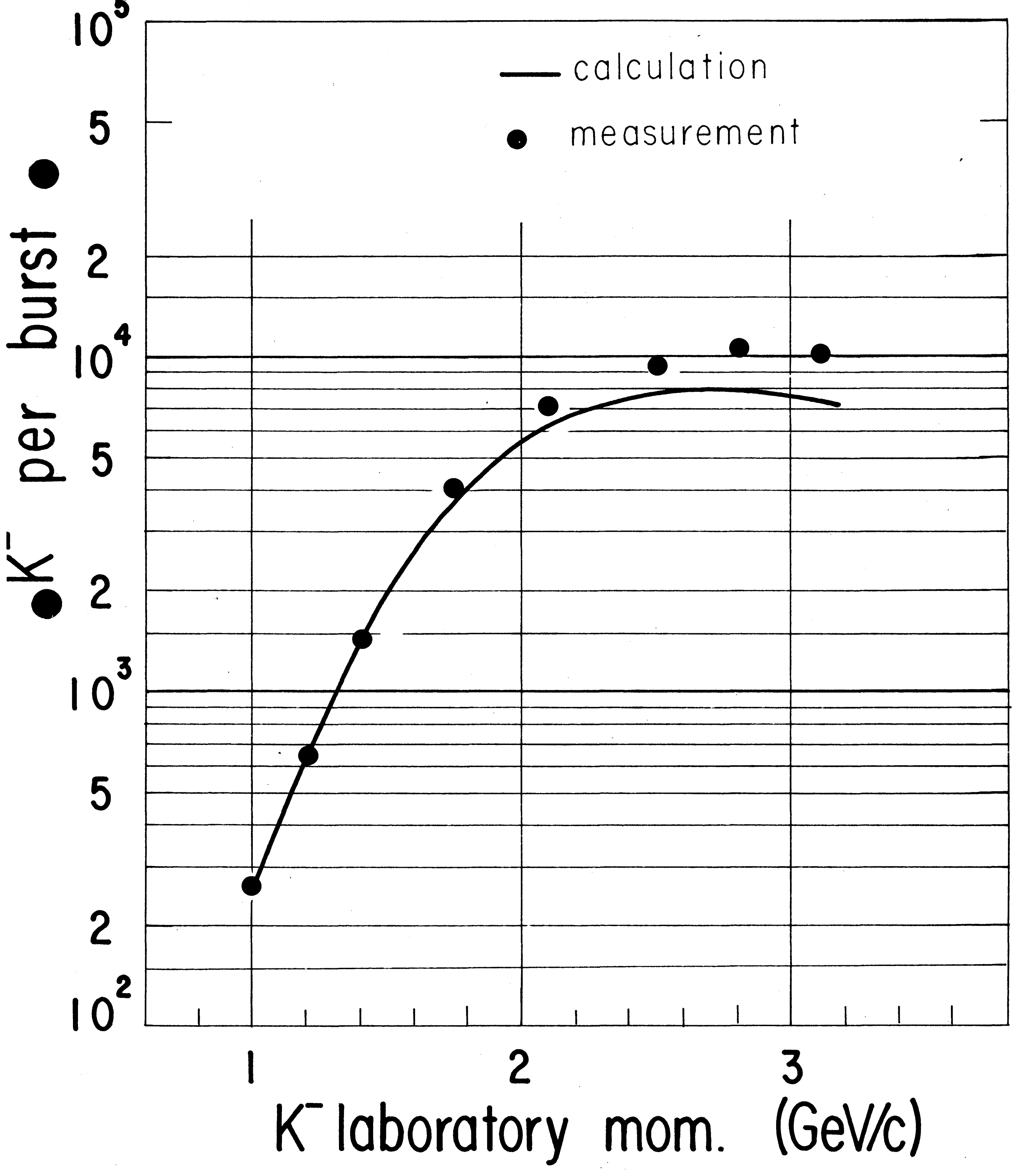
(*) Private communication from SENS' group.

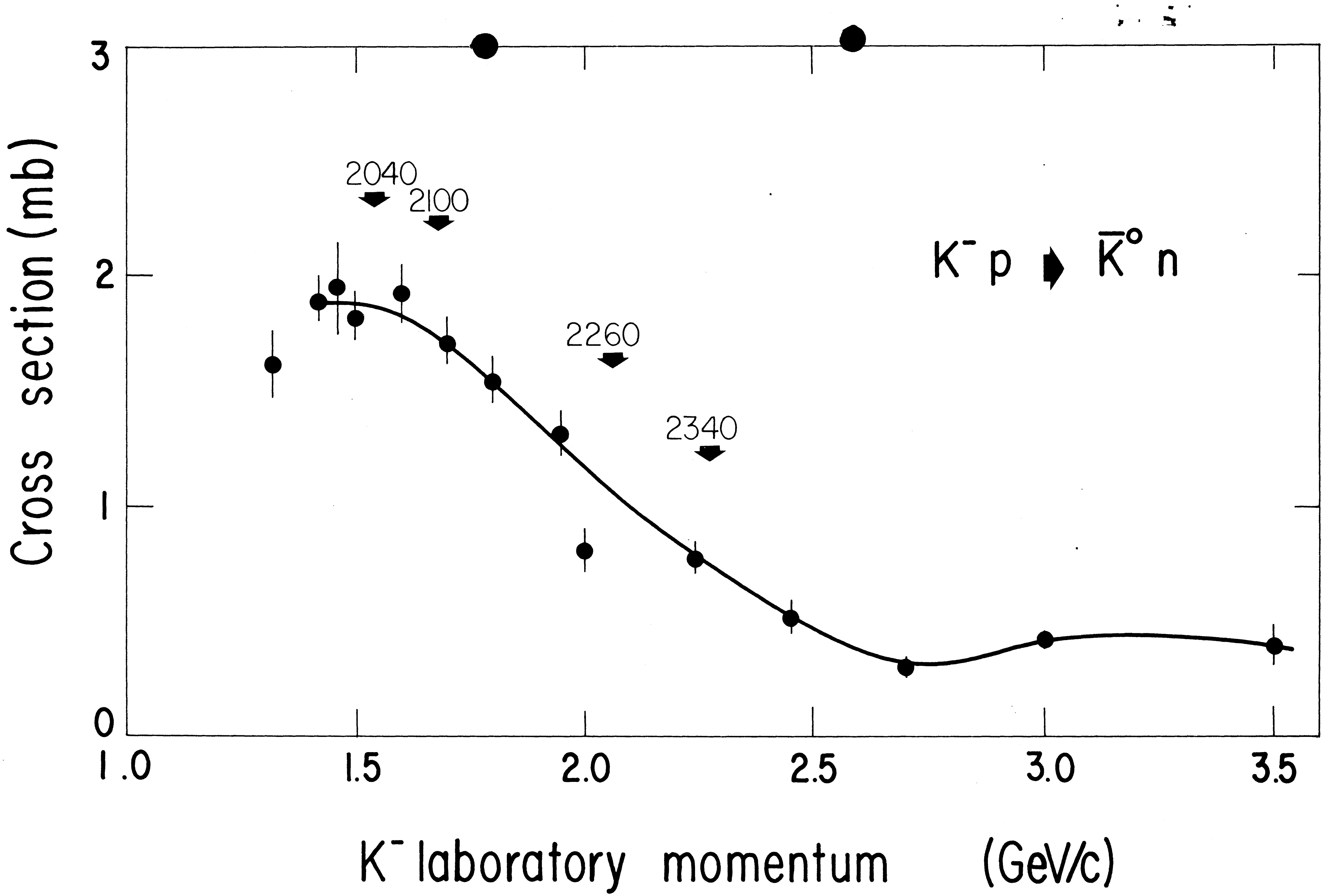
PS/5723/jc

m_{4b} – beam intensity. FIG. 1

2.8 10" proton on target 1 (Beryllium)

$\frac{dP}{P} = \pm 1\%$; L = 35 m; θ = 106 mrad.





Cross section (mb)
3
2
1
0
1.0
1.5
2.0
2.5
3.0
3.5
2040
2100
2260
2340
$K^- p \rightarrow \bar{K}^0 n$
K^- laboratory momentum (GeV/c)

FIG. 2