



CM-P00063210

REQUEST TO EXTEND THE MEASUREMENTS OF R803 IN ORDER TO STUDY THE PRODUCTION OF  $\phi$  AND  $\Lambda$  AT  $\theta_{\text{cm}} = 90^\circ$ .

Motivation.

Recent observations of unexpectedly high rates for the production of single electrons and muons, which is only a factor  $10^{-4}$  less than the pion production at large  $p_T$  (fig. 1), can be interpreted as the decay products of copiously produced vector mesons. This interpretation would require a yield of vector mesons, which is even higher than the pion yield (according to Bjorken at the recent London Conference). It is therefore of utmost interest to try to obtain an estimate of the rate of vector meson production.

Experimental arrangement.

The apparatus of R803, shown in fig. 2, is a spectrometer specially designed to detect particles with low momenta emitted at  $90^\circ$  to the ISR. The spectrometer is actually a pair spectrometer in order to minimize systematic errors due to geometry and beam conditions (particles of both charges are recorded simultaneously). The apparatus is in particular well suited for the detection of pairs of particles with opposite charge emitted in the same direction. The solid angle of the apparatus is limited by the aperture of the magnet ( $25 \times 20 \text{ cm}^2$ ) and the condition that it is placed outside the so-called L-box of the Pisa- Stony Brook experiment. The maximum opening angle of a pair is thus limited to about  $7^\circ$ , which is a severe restriction for the detection of a pair emitted in the decay of a massive particle such as  $\phi$  and  $\Lambda$ . With the L-box removed, however, and this will happen at the end of 1974, the apparatus can easily be shifted forward by about 50 cm as indicated in fig. 3, leaving one proportional chamber and a counter in front of the magnet,

thus increasing the solid angle by a factor of 2.5, which, however, for the case of  $\phi \rightarrow K^+K^-$  detection increases the acceptance by a factor of 12 in the region 1.0 - 1.5 GeV/c (fig. 4). With a luminosity of  $3 \mu\text{b}^{-1}\text{sec}^{-1}$ , corresponding to a circulating current of  $12 \times 12 \text{ A}^2$ , we would record 25  $\phi$  per hour if the rate of  $\phi$  production equals the rate of pion production at 1 GeV.

The particular merits of our set-up is the short length of the spectrometer (1.5 m) and hence a small decay probability for the kaons, and the good time resolution ( $\sigma \sim 0.5 \text{ ns}$ ) of the small counters employed. In order to get a clean sample of  $\phi$  it is necessary to identify at least one of the kaons. The mass resolution is limited mainly by the resolution of the proportional wire chambers (2 mm wire spacing in the bend plane and 4 mm in the nonbend planes) to 40 MeV. It should be noted that the magnetic field is parallel to the ISR beams and we do not expect the fringe field to affect the beams. If necessary an extra magnetic shield plate with a cutout  $6 \times 25 \text{ cm}^2$  can be inserted next to the counter in front.

#### Request for beam time.

We request the permission to stay in I8 during the first two ISR periods of 1975. The request requires the removal of the L-box of R801, which is foreseen to take place during the long annual shutdown in the beginning of 1975. With the limited time available to the group it is impossible to move to another intersection. We therefore suggest that the design around the intersection I8 take our presence during the first two periods into account or if this is not possible that the tests of Willis et al are delayed by two periods (the approved tests of that group could presumably also be done in I7). In order to strengthen the group R803, who will have few physicists left at CERN in 1975, 3 or 4 members of the Stony Brook group would participate in these measurements.

Ref. 1 Chicago - Princeton group, contribution to the High Energy Physics Conference, Imperial College, London 1974 (paper 398).

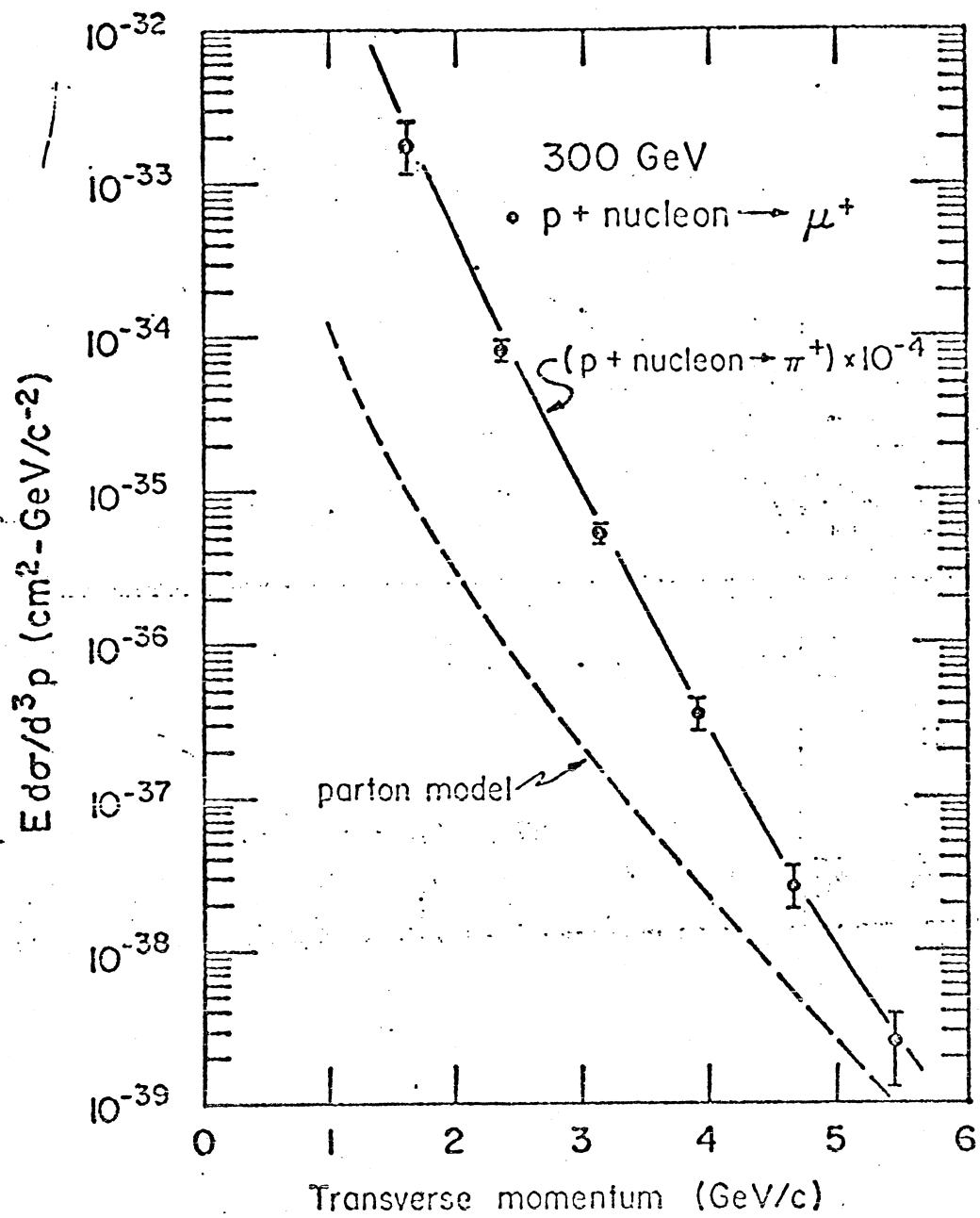


Fig. 1 Muon production in Cu and W targets at  $\theta_{cm} = 90^\circ$  (ref. 1)

R 803

S 2,3,4

S 5,6,7

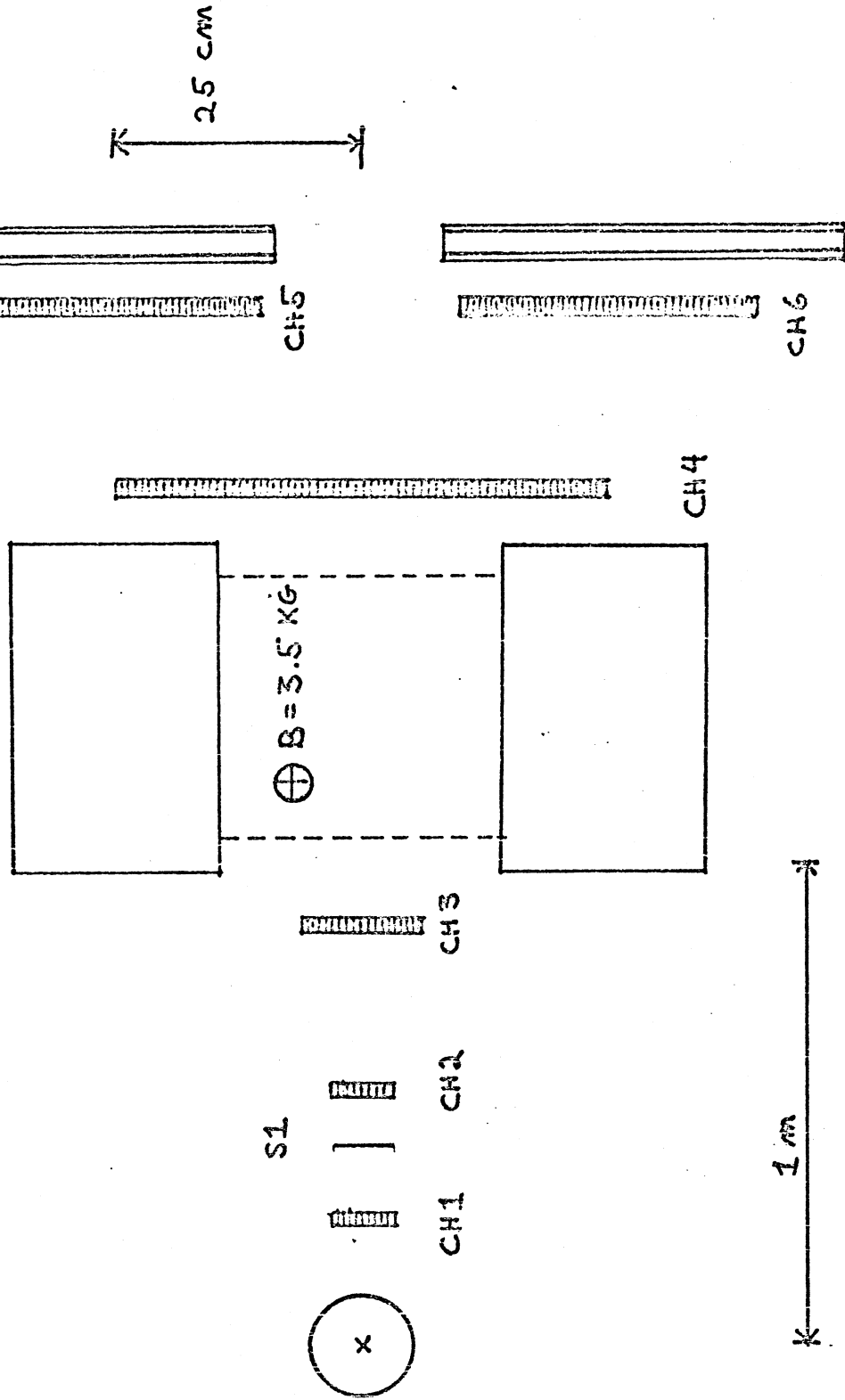


Fig. 2

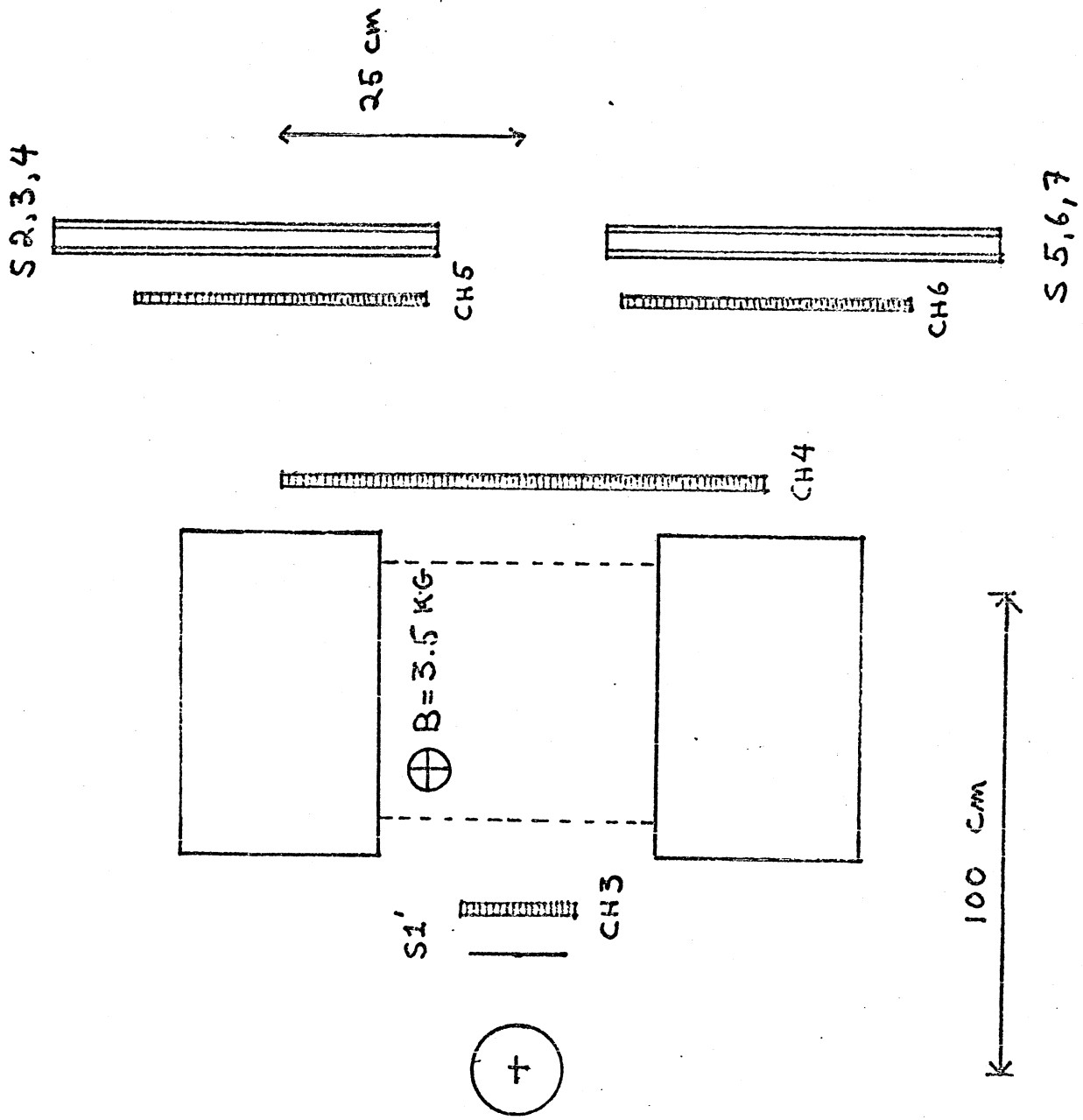


Fig. 3

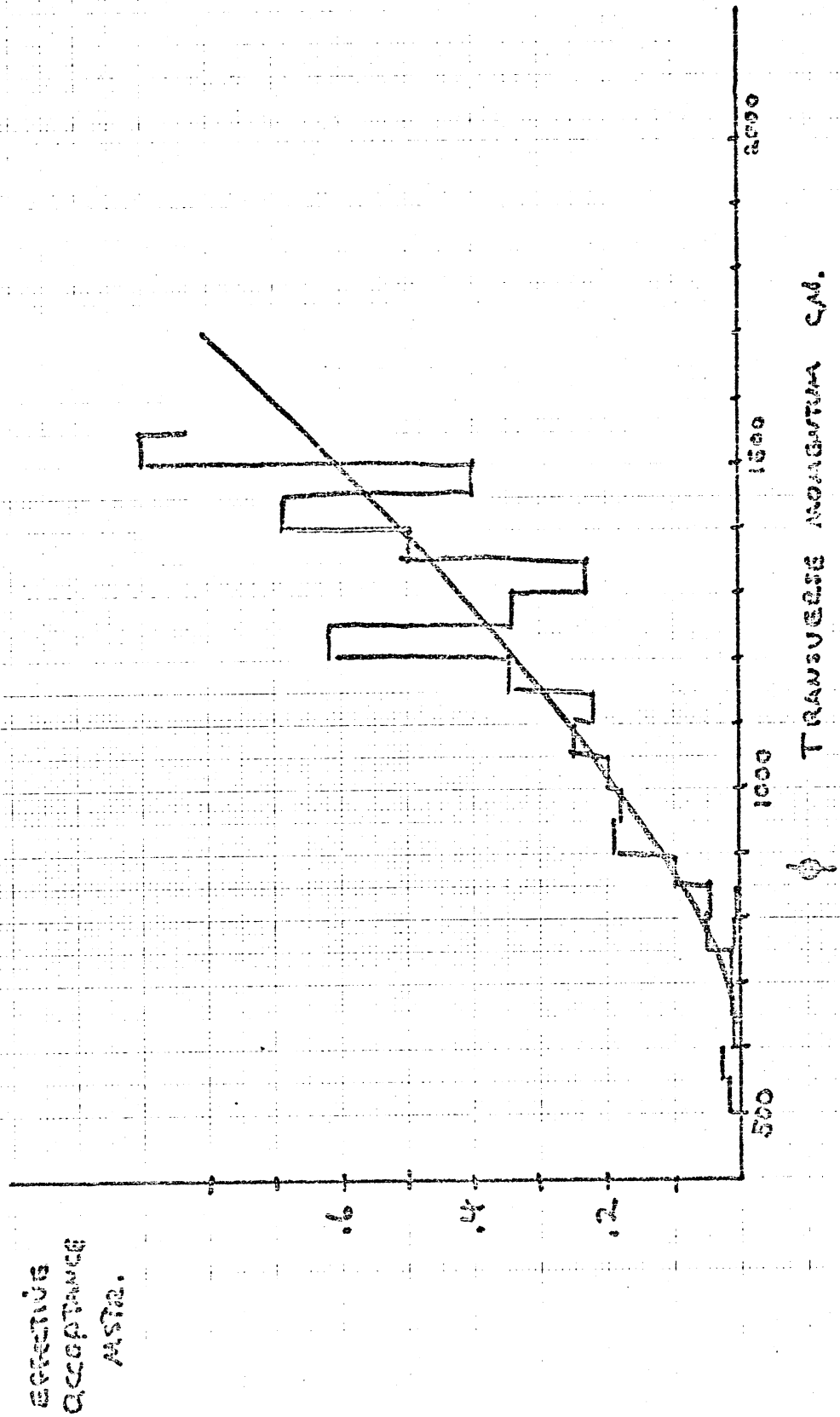


Fig. 4

R803 EXTENSION TO MEASURE  $\phi$  AND  $\Lambda$

(1) Participating physicists:

Scandinavian - CERN

G. Jarlskog  
S. Henning  
L. Jönsson  
H. Ogren

SUNY - Stony Brook

G. Finocchiaro  
P. Grannis  
J. Crouch  
D. Owen  
G. Abshire  
H. Jöstlein  
R. Kephart

(2) Hardware

The existing apparatus and equipment originally supplied by Rutherford Laboratory will be left intact and maintained during the proposed period of this experiment.