Istituto Nazionale di Fisica Nucleare
Sezione di Bologna

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M. N. Focacci, S. Focardi, G. Giacomelli, L. Monari and P. Serra:

$K^- + p$ ELASTIC SCATTERING AT 2. 985 GeV/c.

Only few data are at present available on $K^- + p$ elastic scattering at incident momenta above 1 GeV/c. On the other hand K. Gottfried and J. D. Jackson[1] have recently pointed out the necessity of experimental data in this field to compute cross sections and angular distributions for the high energy quasi two body reactions.

The experiment described here was performed exposing the 80 cm Saclay hydrogen bubble chamber at a K^- beam of the CERN Protonsynchrotron. The incident momentum is 2.985 ± 0.015 GeV/c. The data analysed in this experiment refer to 19, 161 pictures.

All pictures used for this measurement were scanned twice for two prong events. These were measured using digitized tables and computed by the standard CERN programs TRESH, GRIND and BAKE. All events selected as elastic were carefully examined at the scanning table to check the compatibility of observed with computed ionizations. The finally selected 1098 elastic events give the χ^2 distribution appropriate to a 4 constraint fit. Fig. 1 shows the differential elastic cross section $d\sigma/dt$ plotted versus $-t$ the four-momentum transfer squared. The number of events in the first four $|t|$ intervals was corrected to account for the loss of events due to the difficulty of revealing events having the production plane parallel or almost parallel to the cameras optic axes. Such a correction was computed in the usual way considering the experimental azimuthal distribution of production planes of the clearly established elastic events. In the evaluation of cross sections the 10 - 13% μ^- contamination as well as the 5 - 8% π^- contamination was properly taken into account. In Fig. 2 the measured elastic cross section $\sigma_{el} = (5, 32 \pm 0, 23)$ mb is compared with other determinations at different incident momenta in the high energy region.

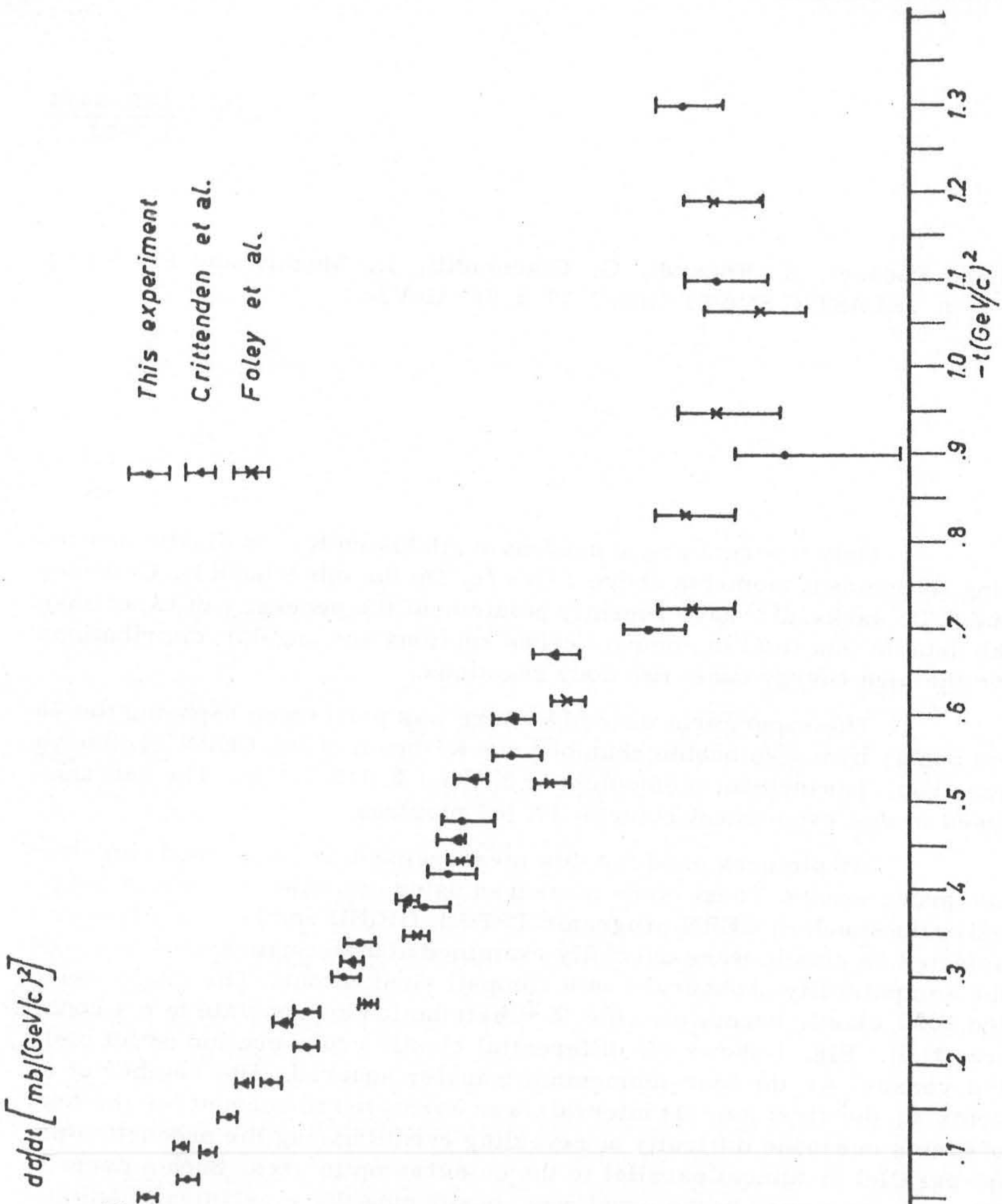
This experiment
Crittenden et al.
Foley et al.
dσ/dt [mb/(GeV/c)²]
-t (GeV/c)²
10²
10¹
10⁰
10⁻¹
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.0
1.1
1.2
1.3

FIG. 1

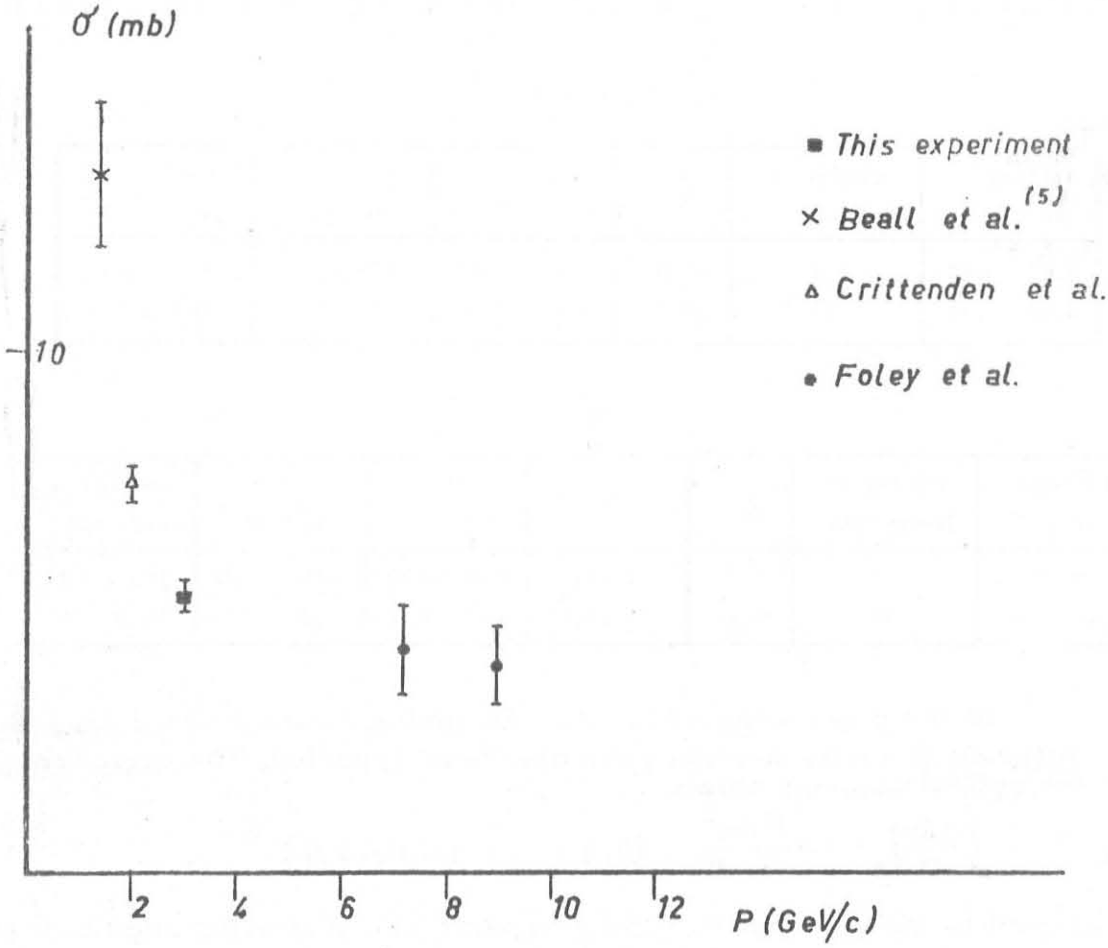
σ (mb)
10
2
4
6
8
10
12
P (GeV/c)
This experiment
Beall et al.(5)
Crittenden et al.
Foley et al.

FIG. 2

The experimental behaviour of the diffraction peak is sufficiently well represented by the functions

$$\frac{d\sigma}{dt} = e^{a+bt} \tag{1}$$

$$\frac{d\sigma}{dt} = e^{A+Bt+Ct^2}; \tag{2}$$

the values of parameters a, b and A, B, C are listed in tables I and II.

TABLE I

$\|t\|$ range $(GeV/c)^2$	number of points fitted	χ^2	a	-b $(GeV/c)^{-2}$	$(d\sigma/dt)_{t=o}$ mb $(GeV/c)^{-2}$
0, 03 - 0, 22	7	6, 07	3, 79 ± 0, 03	8, 86 ± 0, 67	44, 2 ± 3, 5
0, 03 - 1, 10	17	30, 95	3, 63 ± 0, 67	7, 32 ± 0, 31	37, 8 ± 23, 8

TABLE II

$\|t\|$ range $(GeV/c)^2$	number of points fitted	χ^2	A	-B $(GeV/c)^{-2}$	C $(GeV/c)^{-4}$	$(d\sigma/dt)_{t=o}$ mb $(GeV/c)^{-2}$
0, 03 - 0, 22	7	6, 05	3,77 ± 0,17	8,49 ± 3,28	1,56 ± 13,52	43,5 ± 7,4
0, 03 - 1, 10	17	18, 3	3,77 ± 0,07	8,87 ± 0,56	2,34 ± 0,75	43,5 ± 3,0

In the preceeding tables the extrapolated values of forward elastic differential cross section have also been reported. The comparison with the optical theorem value

$$\left(\frac{d\sigma}{dt}\right)_{t=o} = \frac{\sigma_{tot}^2}{16\pi} = 39,3 \pm 2,3 \ \text{mb}\,(GeV/c)^{-2}$$

is compatible with the fact that the real part of the scattering amplitude is rather small.

TABLE III(x)

Incident momentum (GeV/c)	$\|t\|$ range $(GeV/c)^2$	A	-B $(GeV/c)^{-2}$	C $(GeV/c)^{-4}$
2. 0	0, 035 - 1, 2	4, 20 ± 0, 06	10, 9 ± 0, 4	6, 39 ± 0, 39
7. 2	0, 271 - 1, 190	3, 66 ± 0, 30	10, 2 ± 1, 2	3, 97 ± 0, 92
9. 0	0, 265 - 1, 176	3, 62 ± 0, 30	10, 5 ± 1, 2	4, 2 ± 1, 0

(x) - The fit at 2 GeV/c was performed by us, using the data of ref. (2).

Table III reports the values of A, B, C obtained fitting the exponential (2) to the known data of elastic scattering cross section at the incident K^- momenta 2, 7.2 and 9 GeV/c[2,3].

It was already noticed[2] that these three measurements show an identical dependence on t of the diffraction peak. The present experiment substantially confirms the trend (see table II).

As already pointed out experimental data on elastic scattering are needed to describe inelastic processes at small momentum transfers using a peripheral model[1] modified in such a way as to include absorption effects due to the competition of the other inelastic channels. More specifically the parameter in the model depending on the elastic scattering is

$$C = \frac{\sigma_{tot}}{4\pi |b|}$$

where σ_{tot} is the total cross section, while $|b|$ is related to the slope of the exponential fit of the elastic cross section data. The present experiment data give $C = 0,64 \pm 0,05$, being $\sigma_{tot} = 27,76 \pm 0,80$ mb[4] and $|b| = 8,86 \pm 0,67$ $(GeV/c)^{-2}$.

ACKNOWLEDGEMENTS

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REFERENCES

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