EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

POLARIZATION IN pp ELASTIC SCATTERING AT 150 GeV/c

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We report results from a first analysis of data taken at the CERN SPS. The aim of the experiment is to arrive at a better understanding of the role played by spin in high energy hadron-hadron interactions by measuring in the 50 - 150 GeV/c range two-body reactions induced by protons and pions on polarized protons, for which either the target baryon or the beam particle are left with a laboratory momentum between 0.5 and 2 GeV/c ($0.3 \leq -t \leq 3$ GeV^2 for elastic p-p). The dip observed in the cross-section for elastic proton-proton scattering at the ISR energies is located in this region.

The experimental apparatus (Fig. 1) consisting of MWPC and scintillation counter hodoscopes is built around a 1 m diameter magnet at the center of which a polarized proton target (15 cm long and 22 mm diameter) is located. A backward telescope allows the measurement of the low energy particle over a large polar angle. The momentum is obtained by correlating the tracks inside and outside the magnetic field. The time of flight is also measured, to allow a mass determination. The apparatus is completed by a forward arm which makes use of two 2 m bending magnets and a Čerenkov counter; the acceptance is overmatched to the backward arm.

We had run for ~250 hours in the H3 beam, tuned on 150 GeV/c positive particles ($5 - 10 \cdot 10^6$ particles per pulse, mostly protons with ~1% pion contamination); the target polarization has been ~87%.

We have measured the t-dependence of the proton-proton elastic cross-section ($0.3 \leq -t \leq 2.7$ GeV^2), which is shown in Fig. 2, together with an eyeball fit of Fermilab data at 100 and 200 GeV/c[*]. From a preliminary analysis of the up-down asymmetry we have also obtained polarization data up to $t \lesssim -1$ GeV^2, which are compared in Fig. 3 with the 45 GeV/c data[**].

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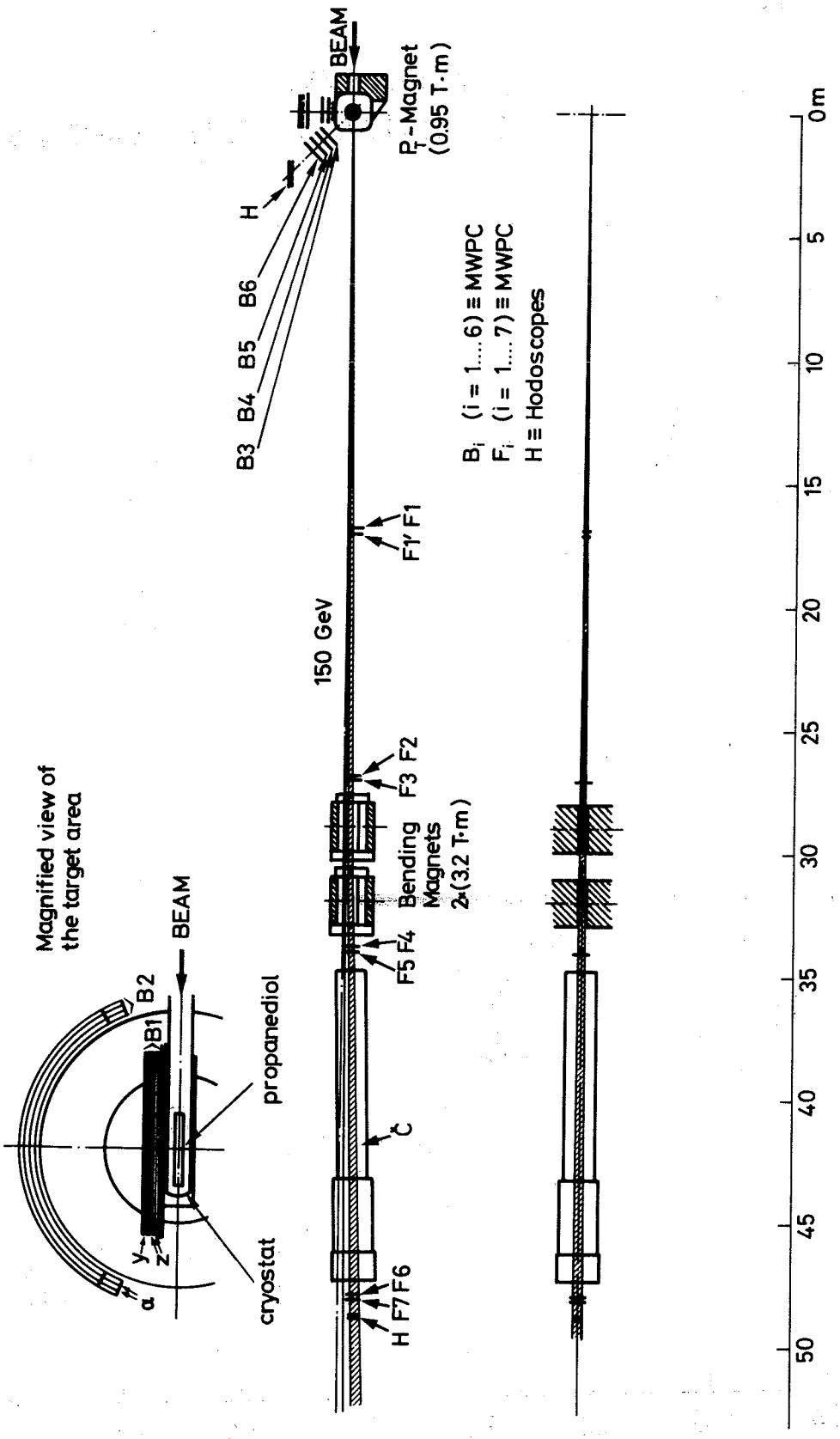
*) C.W. Akerlof et al, Phys. Letts. 59B, 197 (1975)

**) A. Gaidot et al, Phys. Letts. 61B, 103 (1976)

p-p elastic scattering at 150 GeV/c

Differential cross-section	
$-t$ (GeV^2)	$d\sigma/dt$
0.48	530 ± 5 μb GeV^{-2}
0.60	236 ± 3
0.73	55 ± 2
0.88	9.7 ± 0.6
1.08	1.7 ± 0.2
1.28	348 ± 68 nb GeV^{-2}
1.50	148 ± 38
1.74	98 ± 33
1.98	81 ± 29
2.26	37.5 ± 18
2.54	35.5 ± 17
Polarization parameter	
$-t$	P
0.29	0.016 ± 0.039
0.40	-0.010 ± 0.022
0.53	-0.012 ± 0.012
0.66	-0.015 ± 0.016
0.83	-0.043 ± 0.033
0.98	-0.101 ± 0.082



Experiment WA6: Polarization in pp and πp Elastic Scattering

Fig. 1

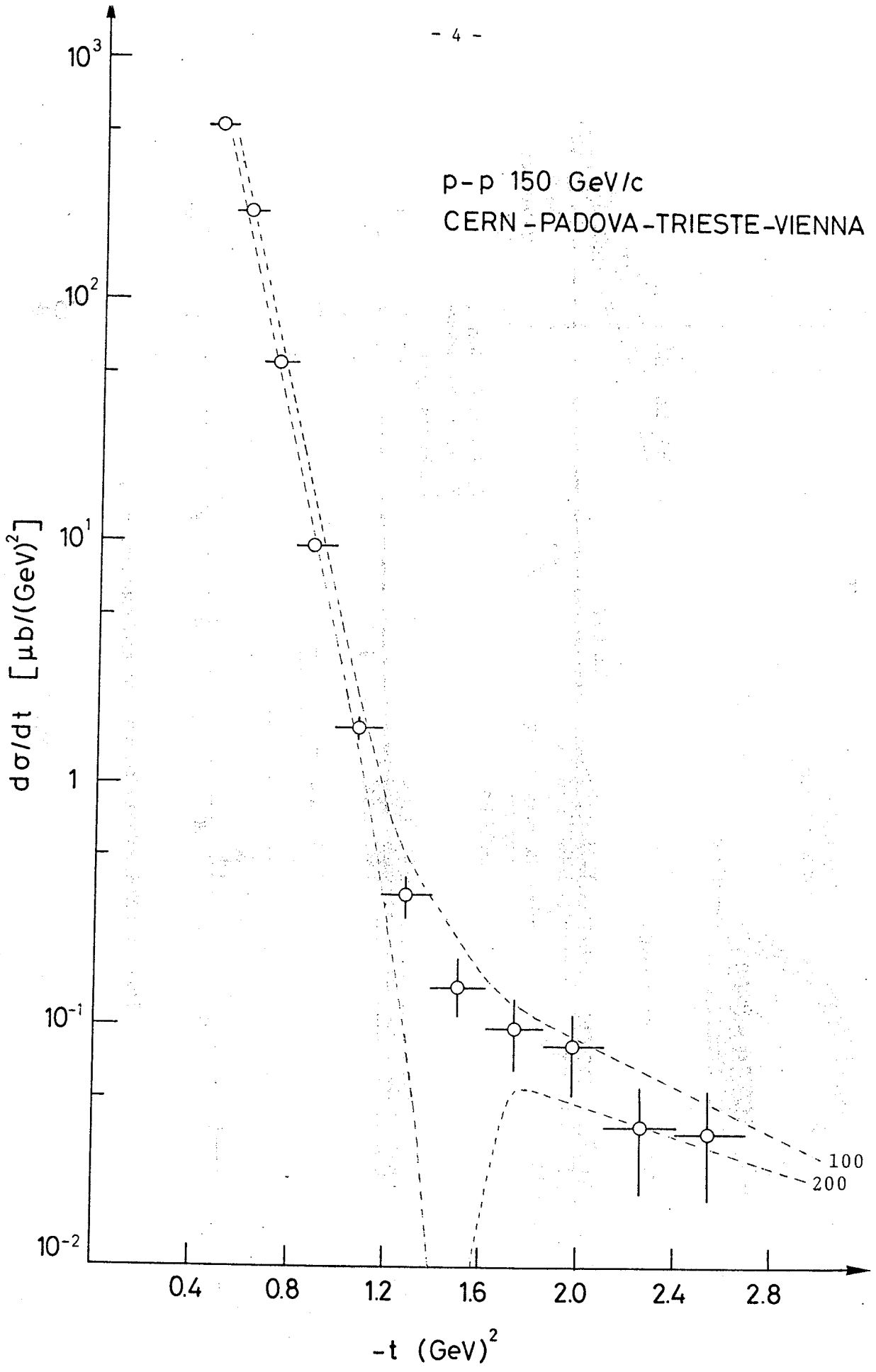

p-p 150 GeV/c
CERN-PADOVA-TRIESTE-VIENNA
10^3
10^2
10^1
1
10^{-1}
10^{-2}
$d\sigma/dt$ [$\mu b/(GeV)^2$]
0.4
0.8
1.2
1.6
2.0
2.4
2.8
$-t$ $(GeV)^2$
100
200

Fig. 2

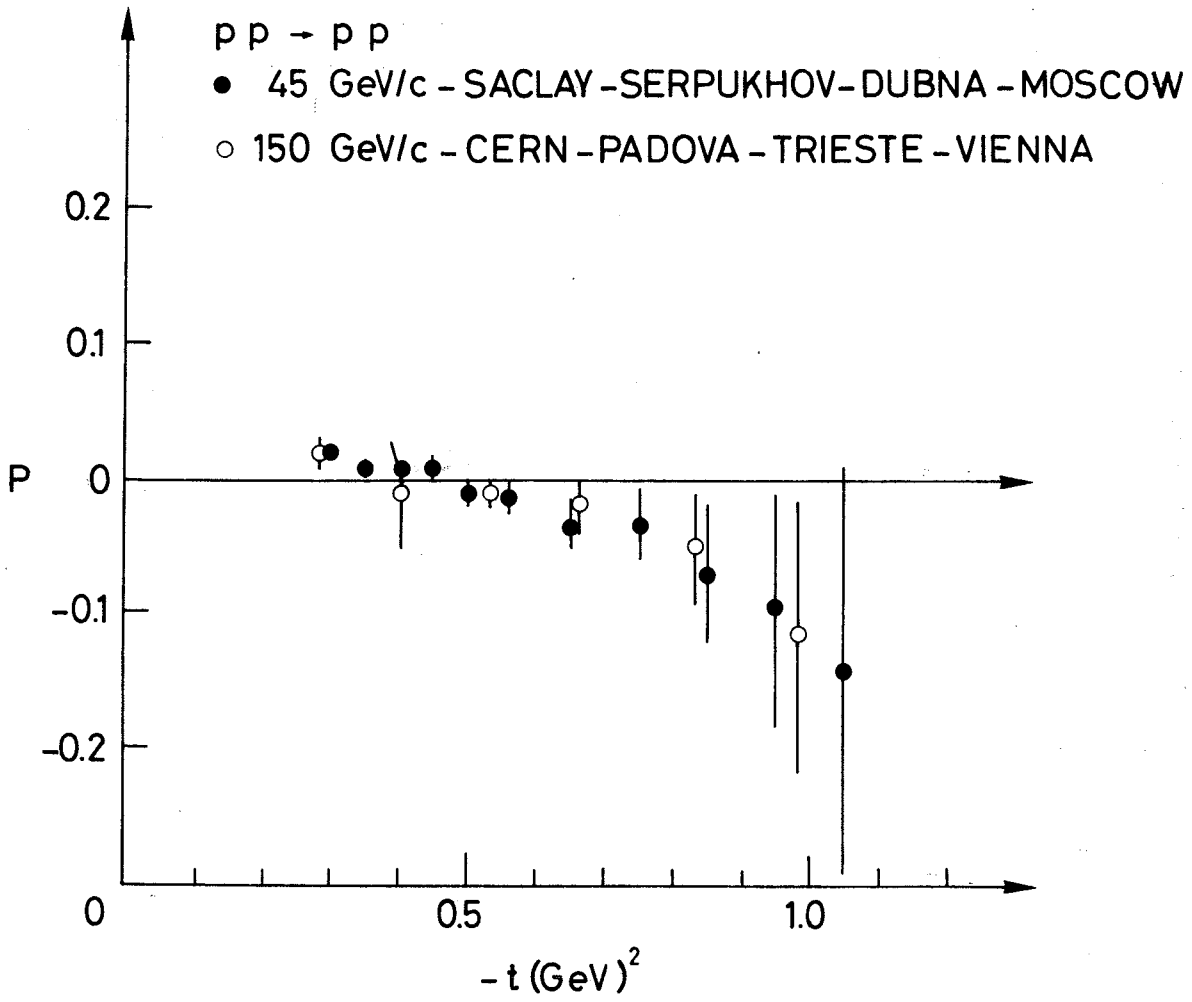

p p → p p
● 45 GeV/c - SACLAY - SERPUKHOV - DUBNA - MOSCOW
○ 150 GeV/c - CERN - PADOVA - TRIESTE - VIENNA
0.2
0.1
P
0
-0.1
-0.2
0
0.5
1.0
- t (GeV)²

Fig. 3