THE t' DISTRIBUTION FOR $\bar{p} \to \bar{p}\pi^-$ IN THE REACTION $\bar{p}p \to \bar{p}p\pi^-\pi^+$ AT 7.3 GeV/c

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INTRODUCTION

We are analyzing a 5 events/µb $\bar{p}$ exposure at 7.3 GeV/c in the Cern 2 meter hydrogen chamber. So far about 3000 events of the final state $\bar{p}p\pi^-\pi^+$ have been put on the DST. Using the procedure followed by Atherton et al[1] in their 5.7 GeV/c $\bar{p}$ experiment we plotted the logarithm of the number of events as a function of -t' (t' = t - t_{max}, t between $\bar{p}$ and $\bar{p}\pi^-$). In agreement with their results we find a kink in the slope at t' = -0.07. The value of the slopes, however, is higher at 7.3 GeV/c than at 5.7 GeV/c.

EXPERIMENTAL CONDITIONS

The beam is the Cern RF separated u5 beam which consists for two thirds of anti-protons, 30% muons and about 2% pions. The film is scanned twice, only for four-prongs. The interaction points were premeasured on three ENETRA film-plane digitizers on-line with a CDC 6400 computer. The tracks were measured on an HPD working in the minimum guidance mode. For geometrical and kinematical analysis the Cern HYDRA system was used. Of the events which failed in the geometrical reconstruction, the missing tracks were remeasured on the ENETRA system and combined with the tracks coming from the HPD. After kinematics 50% of the events could be identified automatically, using HPD ionisation measurements, thus reducing by half the number of events to be decided manually. A total number of 20 000 four-prongs are now on the DST representing 30% of the complete experiment.

RESULTS

The logarithm of the number of events as a function of -t' between $\bar{p}$ and $\bar{p}\pi^-$ system is plotted for several selections of events in Fig. 1-4. In Fig. 1 all events are plotted. In Fig. 2 and 3 only events are plotted for which the mass of the $p\pi^+$ and $\bar{p}\pi^-$ respectively lies between 1.18 GeV/c^2 and 1.28 GeV/c^2, the Δ region. For the events in Fig. 4 both $p\pi^+$ and $\bar{p}\pi^-$ lie in this mass region.

In Fig. 5 the normalized distribution of cosθ in the Gottfried-Jackson system of $p\pi^+$ is given for the Δ^{++} region, with -t' less than .07, -t' between .07 and .5 and -t' greater than .5. The analogous figures for the $\bar{p}\pi^-$ system are given in Fig. 6. The slopes determined from the data given in Fig. 1-4 have been collected in Table 1 and are compared with results at 5.7 GeV/c[1]. The moments of the distributions belonging to Fig. 5 and Fig. 6 are given in Table 2 and Table 3.

DISCUSSION

The reaction mechanisms for the three t' regions look different. For a pure one pion exchange the Y_{20} moment should be .13, which is in fact approximately the value found in the region $-t' < 0.07$. In the other regions either absorption effects are more important or other mechanisms may be involved. Compared with the results of Atherton et al. at 5.7 GeV/c the slope in the region $-t' < 0.07$ is increased from 14 ± 2 till 20 ± 4. This work is part of the joint research programs of FOM and ZWO.

REFERENCES

1) The analysis of the reaction $\bar{p}p \rightarrow \overline{\Delta^{++}}\Delta^{++}$ at 5.7 GeV/c.

2) H.W. Atherton, B.R. French and J. Skura, Cern. Geneva.

3) J. Böhm, J. Cvack, M. Jires, J. Sedlek, V. Simak and J. Zacek.
   Institute of Physics, CSAV, Prague.
   Presented at the Aix Conference HEP 73-8 July 1973.

TABLE 1

THE SLOPES IN THE t' DISTRIBUTION

| | $-t' < 0.07$ | | $0.07 < -t' < 0.5$ | |
	7.3 GeV/c	5.7 GeV/c[1]	7.3 GeV/c	5.7 GeV/c[1]
all events	13.6 ± 1.7		4.5 ± .3	
$p\pi^+ = \Delta^{++}$	17.2 ± 2.5		5.2 ± .5	
$\bar{p}\pi^- = \bar{\Delta}^{--}$	15.8 ± 2.6		4.4 ± .5	
$p\pi^+, \bar{p}\pi^- \Delta^{++}, \bar{\Delta}^{--}$	20.0 ± 3.7	13.6 ± 2.0	6.6 ± 2.5	5.7 ± 0.3

TABLE 2

MOMENTS IN THE GOTTFRIED-JACKSON SYSTEM FOR $p\pi^+ = \Delta^{++}$

	$-t' < 0.07$	$0.07 \leqslant -t' < 0.5$	$0.5 \leqslant -t'$
Y_{00}	.28	.28	.28
Y_{10}	.00 ± .02	.00 ± .01	.01 ± .02
Y_{11}	.00 ± .01	-.01 ± .01	-.01 ± .02
Y_{20}	.07 ± .02	.05 ± .01	.00 ± .02
Y_{21}	.02 ± .01	-.02 ± .01	-.03 ± .02
Y_{22}	-.01 ± .01	.00 ± .01	-.02 ± .02

TABLE 3

MOMENTS IN THE GOTTFRIED-JACKSON SYSTEM FOR $\bar{p}\pi^- = \bar{\Delta}^{--}$

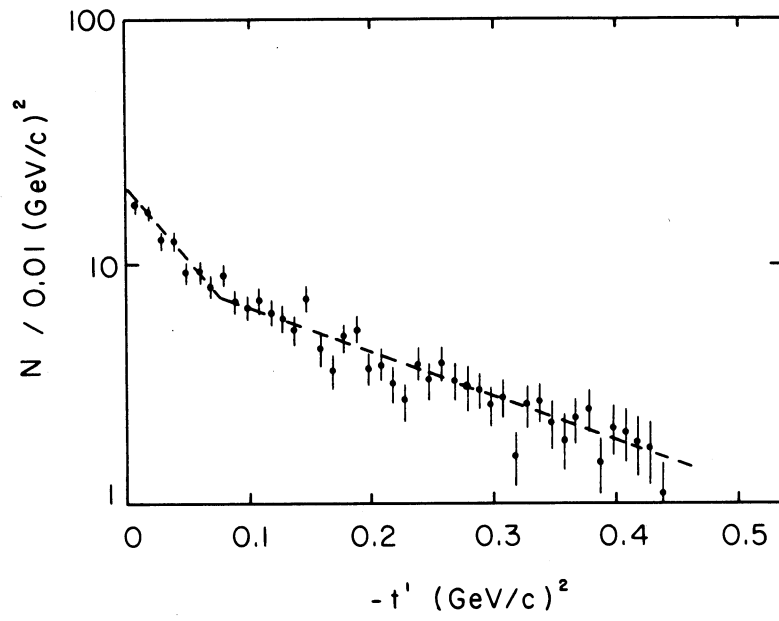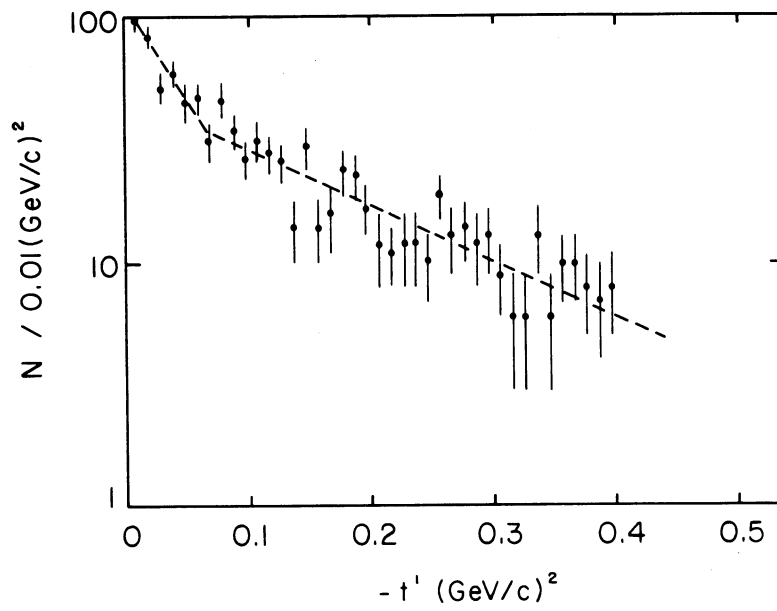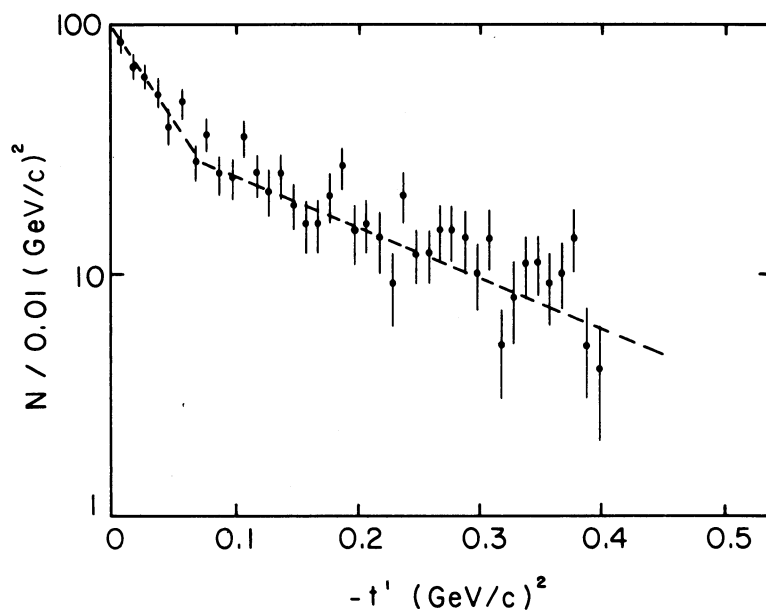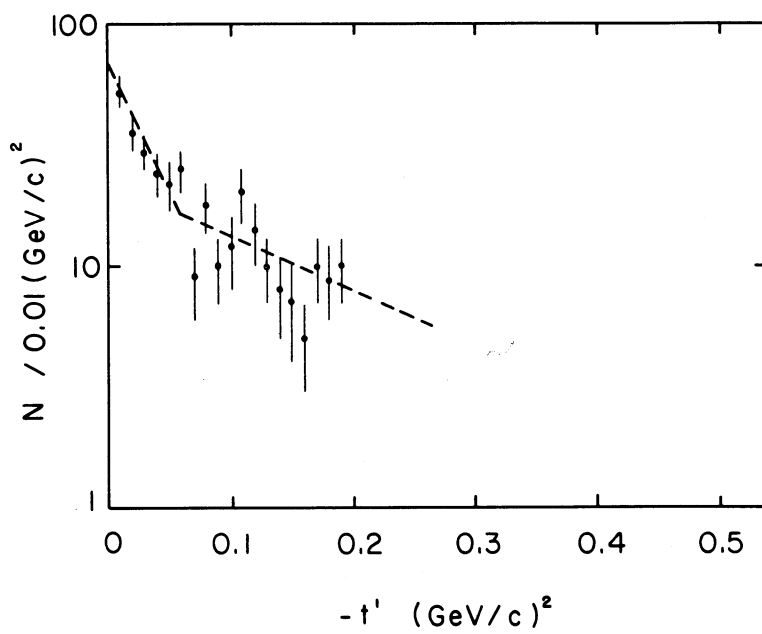|	$-t' < 0.07$	$0.07 \leqslant -t' < 0.5$	$0.5 \leqslant -7'$
Y_{00}	.28	.28	.28
Y_{10}	.04 ± .02	.01 ± .01	.00 ± .02
Y_{11}	.02 ± .01	-.02 ± .01	.01 ± .02
Y_{20}	.08 ± .02	.05 ± .01	-.05 ± .02
Y_{21}	-.02 ± .01	-.02 ± .01	-.01 ± .02
Y_{22}	.01 ± .01	.00 ± .01	.00 ± .02

Fig. 1

Fig. 2

Fig. 3

Fig. 4

cos θ distribution normalized to 100 events

in Gottfried Jackson system of pπ^+ in $\overline{\Delta}^{++}$

Fig. 5

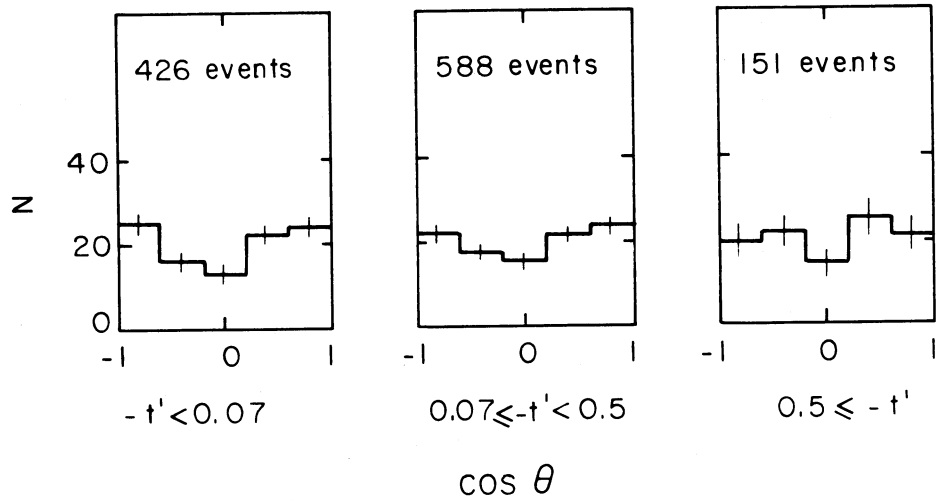cos θ distribution normalized to 100 events

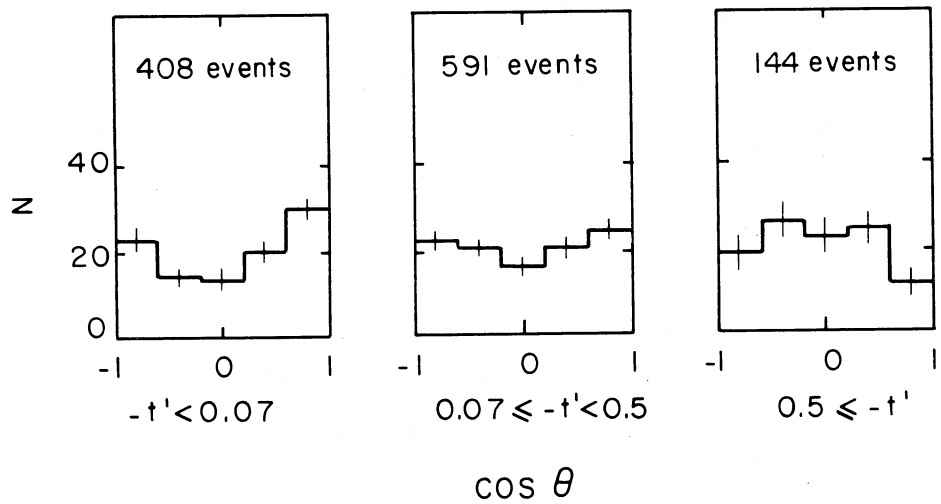in Gottfried Jackson system of $\overline{p}\pi^-$ in $\overline{\Delta}^{--}$

Fig. 6