

Preliminary results on production of  $\pi^0\pi^0$  in  $\bar{p}p$  annihilation at rest

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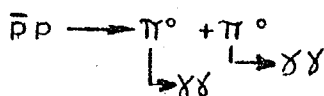
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Before 1971 the  $\bar{p}p$  annihilation at rest, for several theoretical and experimental indications, was supposed to proceed mainly via s - wave <sup>(1)</sup>. In 1971 Devons et al. <sup>(2)</sup> published a result on a branching ratio

$$B_{\pi\pi^0} = \frac{\Gamma(\bar{p}p \rightarrow \pi\pi^0)}{\Gamma(\bar{p}p \rightarrow \text{total})} = 4.8 \times 10^{-4} (\pm 20\%)$$

for  $\bar{p}p$  annihilation at rest. Since this channel is forbidden by parity conservation if even L - waves are considered, they deduced a  $\sim 39\%$  odd L-states contribution in annihilation at rest.

The reaction



has been recently investigated in a new experiment at CERN PS.

The apparatus was composed of 4 electromagnetic (lead-scintillator-optical spark chambers) shower detectors with  $\sim \pm 20\%$  energy resolution, surrounding a liquid  $H_2$  target. A cylindrical veto counter around the target guarantees neutral annihilation products.

A one R.L. lead converter followed by a packet of thin foil optical spark chambers in front of each shower detector allowed precise measurement of  $\gamma$  - ray directions.

Pictures of <sup>the</sup> spark chambers were taken when an antiproton stopped in the target gave neutral products releasing more than 600 MeV energy in two opposite detectors. A sample of the pictures collected were scanned for  $2 \times 2 \gamma$  events.

After reconstruction of the  $\pi^0$  directions and cuts in coplanarity and total energy,  $\sim 105$  events corresponding mainly to  $\bar{p}p \rightarrow 2\pi^0$  at rest and in flight were left. Their opening angle distribution is shown in fig. 1. A clear peak of collinear events ( $180^\circ$ ) can be attributed to reaction  $\bar{p}p \rightarrow 2\pi^0$  at rest. The remaining events, between  $153^\circ$  and  $170^\circ$ , can be attributed to the same reaction with antiprotons

in flight between 150 and 450 MeV/c <sup>(3)</sup>. The observed number of events at rest corresponds to a branching ratio:

$$BR_{\pi^0\pi^0} = (1.4 \pm 0.5) \times 10^{-4}$$

the events in flight yield a cross section  $\sigma(\bar{p}p \rightarrow \pi^0\pi^0) = (93 \pm 32) \mu\text{b}$ , at a average antiproton momentum of 300 MeV/c.

From this branching ratio an  $\sim (11 \pm 4) \%$  odd **L**-states contribution in the  $\bar{p}p$  annihilation at rest can be deduced <sup>(2)</sup>.

REFERENCE

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P. Frenkel et al., Nuclear Physics B47, 61 (1972).
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- 3) G. Bassompierre et al., Nuclear Instr. and Methods 140, 251 (1977).

Figure - Captions:

Fig. 1 Opening angle distribution of  $2 \pi^0$  from reaction  $\bar{p}p \rightarrow \pi^0 \pi^0$ ,  
the dashed line represents the expected contribution of antiproton-proton annihilation in flight.

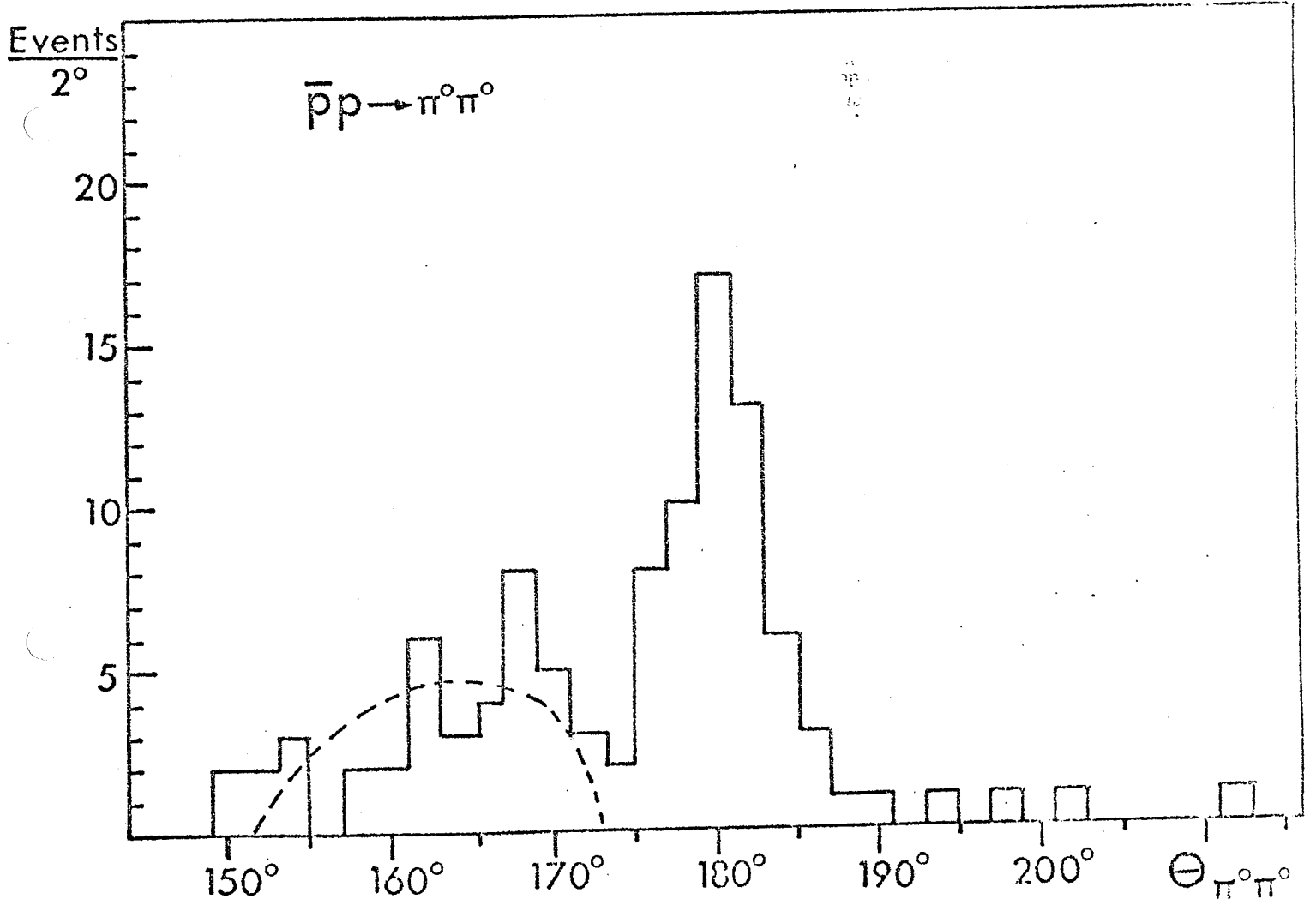


Fig. 1