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IN THE $(\pi - \mu)$ DECAY

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At the Varenna Conference (Italy 1957) some results on the angular distribution of μ^+ in the $\pi - \mu$ decay were presented by Lattes, and the possibility of any asymmetry in this angular distribution was discussed.

Further experiments [1-4] led for the asymmetry co-efficient $\beta = 2 \dfrac{N_F - N_B}{N_F + N_B}$ (N_F and N_B are respectively the number of decays forwards and backwards with respect to the direction of the π^+ beam) to different values between $\beta = -0,447 \pm 0,082$ and $\beta = +0,052 \pm 0,058$.

At the Venice Conference [5] the conclusion drawn from the great difference between the values obtained for β that likely there exist no asymmetry in the $\pi - \mu$ decay and when it could be observed it is due to different biases.

In the present paper we are giving the results of 10000 $\pi - \mu$ decays, π^+ ending in emulsion of type R NIKFI. The stack was exposed in the π^+ beam from the Dubna synchrocyclotron with magnetic shielding. Scanning was made through area with a microscope MBI-3 and magnification 100^x. Identification of $\pi - \mu$ events was made visually.

There were measured projections in the plane of emulsion of angles between the initial direction of μ meson and the π-beam direction. Angles were measured with $\pm 3^\circ$ precision. Fig. 1a shows the angular distribution. The resulting asymmetry coefficient is $\beta = -0,048 \pm 0,020$.
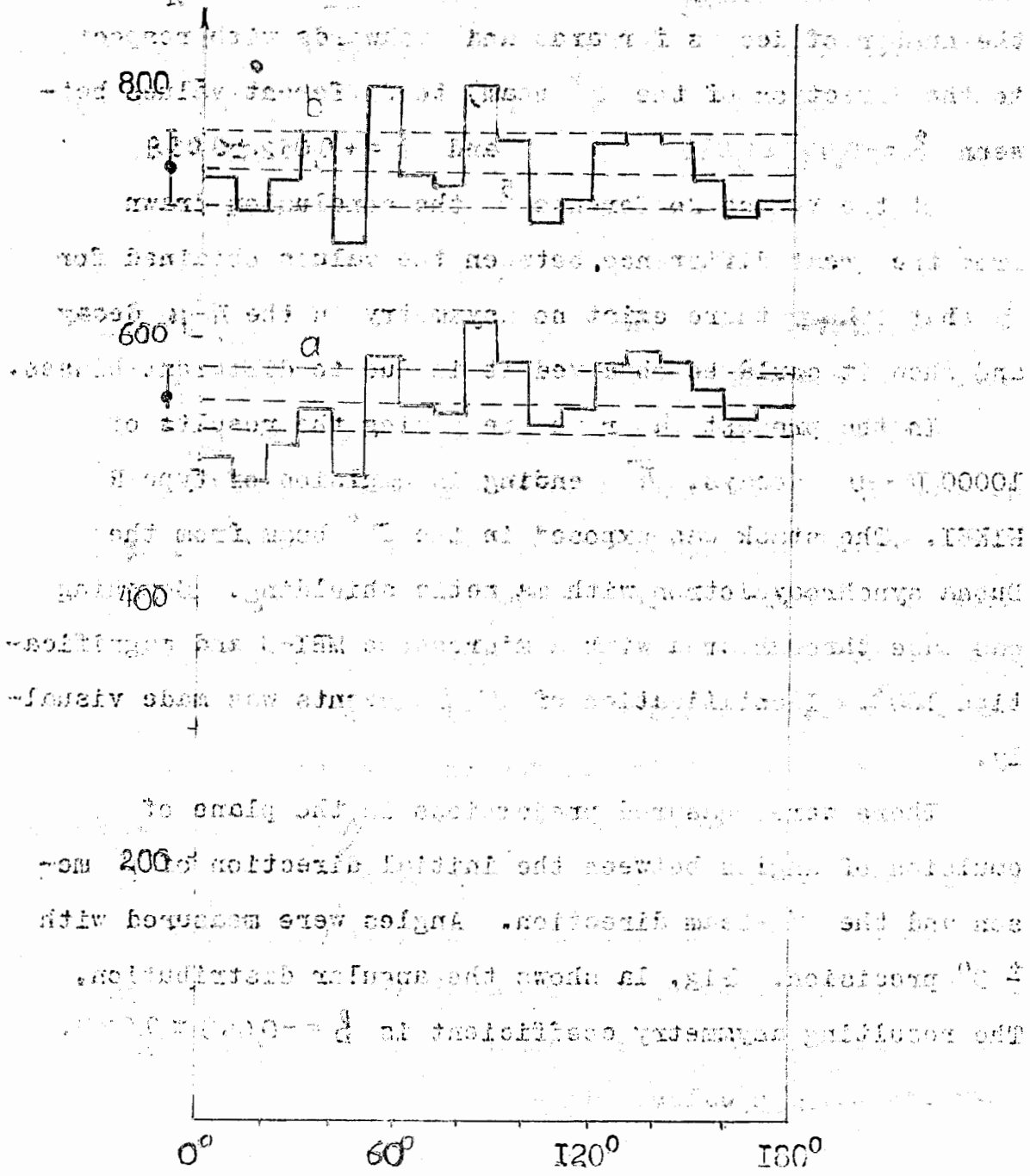
Fig 1

To evaluate this bias during the scanning process, following professor Gurevich's suggestion, the same area was twice scanned and the projected angles θ^* between the final direction of the π^+ meson and the initial direction of μ^+ were measured. Then the events measured two times were identified.

Fig. 2 shows the events found one and twice (hyst. a and β respectively). Comparing a and β one can see immediately that the probability of finding events decreases towards small values of θ^x (Fig.3).

The distribution of 1a was corrected through the probability of finding π-μ events (Fig.3) and taking into account the angular distribution of the final direction of π^+ with respect to the beam direction (Fig.4). The corrected distribution is given in Fig. 1b and the asymmetry coefficient is found to be $b = 0.009 \pm 0.018$.

We believe that the asymmetry which was reported in some other works could be at least partially explained by the scanning bias which we studied.

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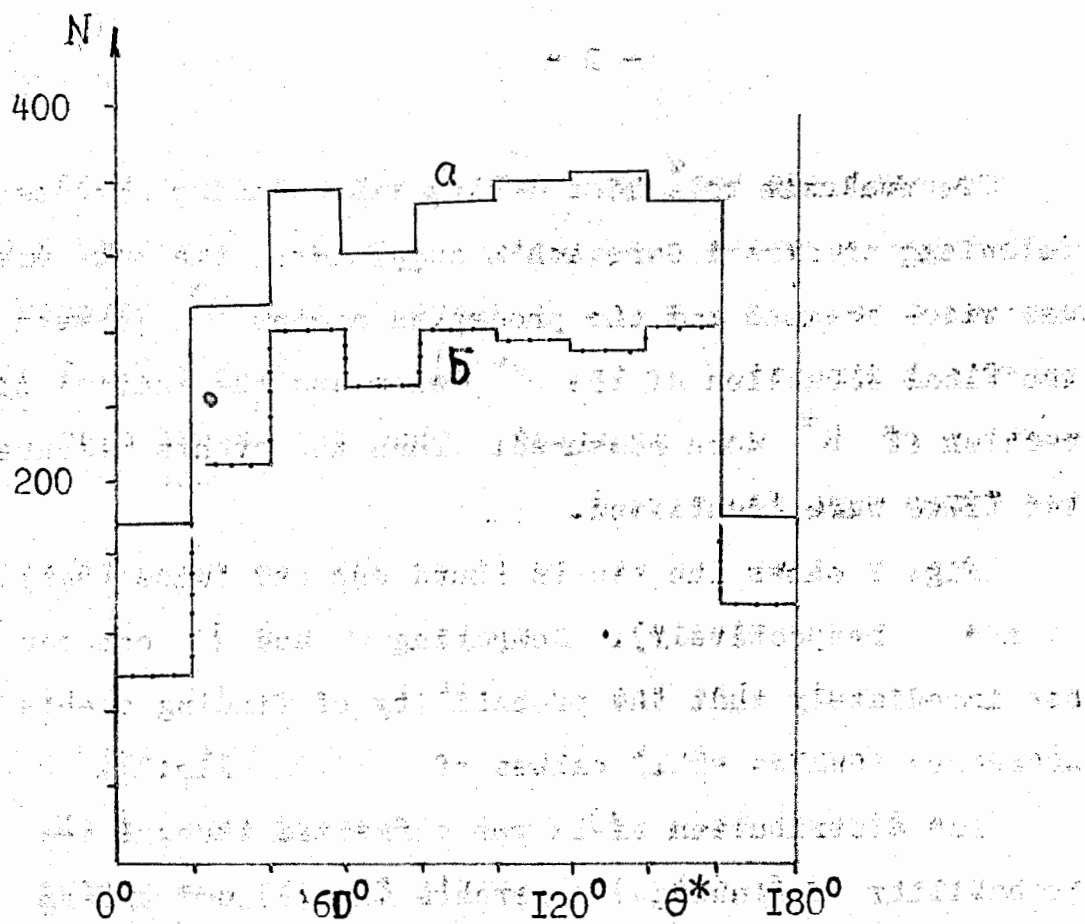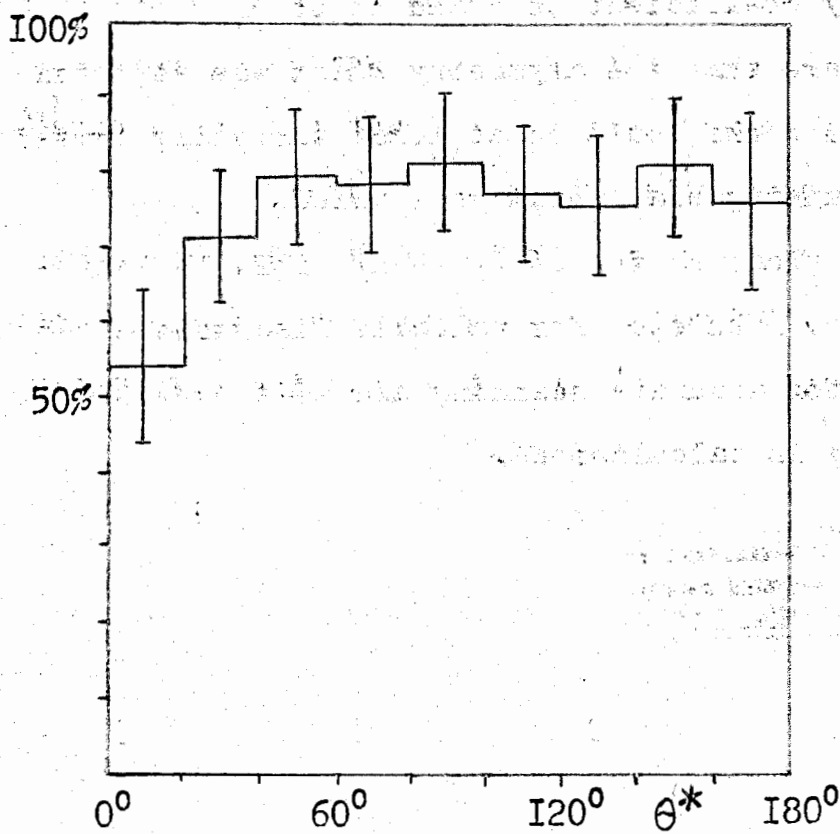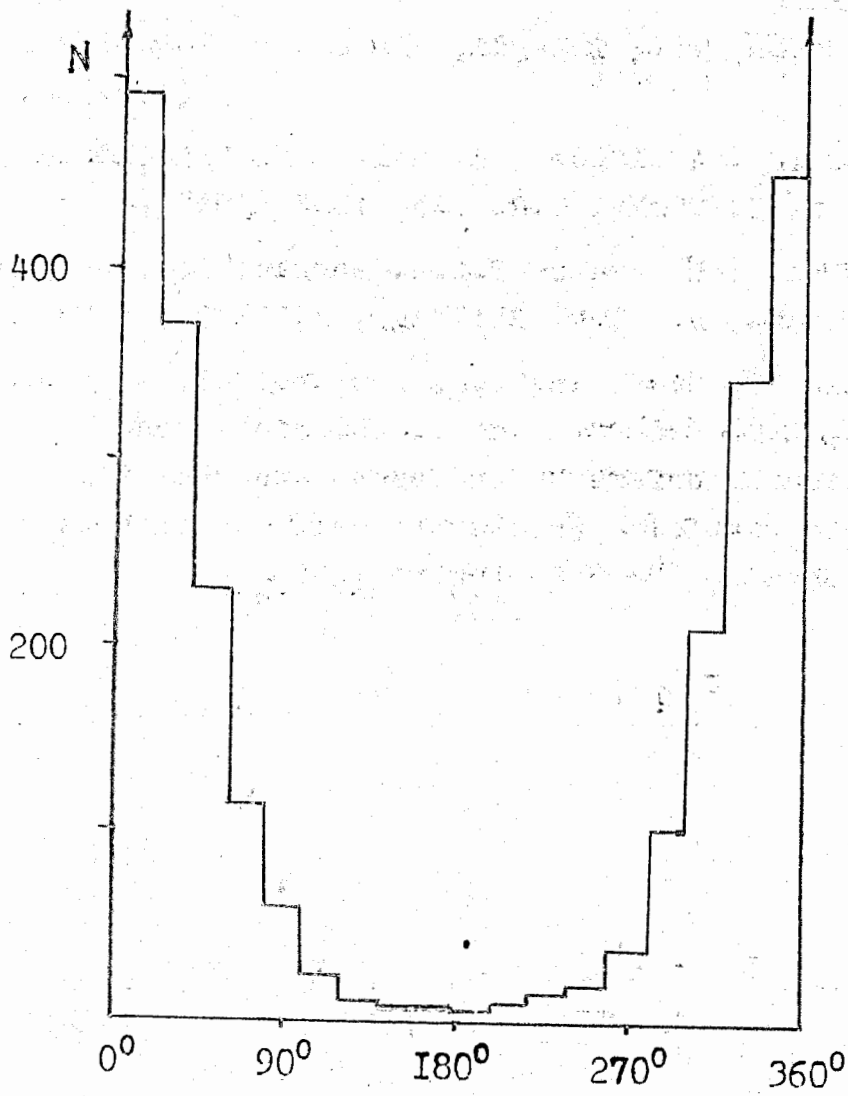
Fig 2

Fig. 4

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