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V.S. Barashenkov

THE MULTIPLE PRODUCTION OF PARTICLES IN (pp)- AND (π^- p)-COLLISIONS AT ENERGIES OF (1÷10) BEV

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In Figs. 1 and 2 the calculated probabilities W_n of the 2-, 4-, 6 - prong star production and the calculated number of the charged particles $\bar{n}$, produced in (π^-p) and (pp)-collisions are given. The interaction between the created π-mesons and the nucleons was taken into account [1]. All other assumptions and the method of the calculations are the same as in the papers [2]. When drawing the curves the results of the calculations [1], [2] were used. The experimental data [3]-[5] are given for comparison. The statistical errors ΔW_n and the dispersion $\Delta \bar{n}$ are also indicated. Within these errors the experimental data are close to the theoretical ones. However, the experimental number of the two prong stars in (pp)- collisions is greater then the theoretical one. Yet, the number of the found events is insufficient to draw the conclusions about many-prong stars ($n > 4$).

The qualitative difference is observed if the theoretical angular prong distributions are compared with the experimental ones: the theoretical distributions are isotropic (in the c.m.s.) but the experimental ones are non-isotropic and even asymmetrical with respect to the angle $\theta = \pi/2$ (in (π^-p) - and (pn) - collisions [4], [5]).

To account for the differences following [6] we take into consideration the peripheral collisions. It is possible to explain the asymmetry in (pn)- collisions, if the nucleon, which lost the virtual π - meson, passes into an excited state (isobar), which further decays1). The statistical theory of multiple production was used and the diffraction scattering was taken into account in the calculations of the peripheral π-meson collisions with a nucleon and π - meson. It is possible to explain the experimental data, if $\xi \equiv \sigma^p_{NN}/\sigma_{NN} \gtrsim 0{,}2 \div 0{,}3$ and $\eta \equiv \sigma^p_{\pi N}/\sigma_{\pi N} \gtrsim 0{,}2$, where σ^p is the cross section of the peripheral collisions; σ_{NN} and $\sigma_{\pi N}$ are the total cross sections of (NN)- and (πN)-collisions. From here we obtain an estimate of the ($\pi\pi$) - interaction cross section

$$\sigma^p_{NN} = 2\int \sigma_{\pi N}(\varepsilon)\, q(\varepsilon)\, d\varepsilon \approx 2\sigma_{\pi N}\cdot n;$$

$$\sigma^p_{\pi N} = \int \sigma_{\pi\pi}(\varepsilon)\, q(\varepsilon)\, d\varepsilon \approx \sigma_{\pi\pi}\cdot n,$$

where $q(\varepsilon)$ is a peripheral meson spectrum [6]. Since $\sigma_{\pi N} \sim \sigma_{NN}$ then

$$\sigma_{\pi\pi} \sim \sigma_{\pi N}\, 2\eta/\xi \sim \sigma_{\pi N}$$

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1) After the calculations have been made V.I. Veksler informad me that I.E. Tamm had examined also the isobar in the peripheral collisions (unpublished).

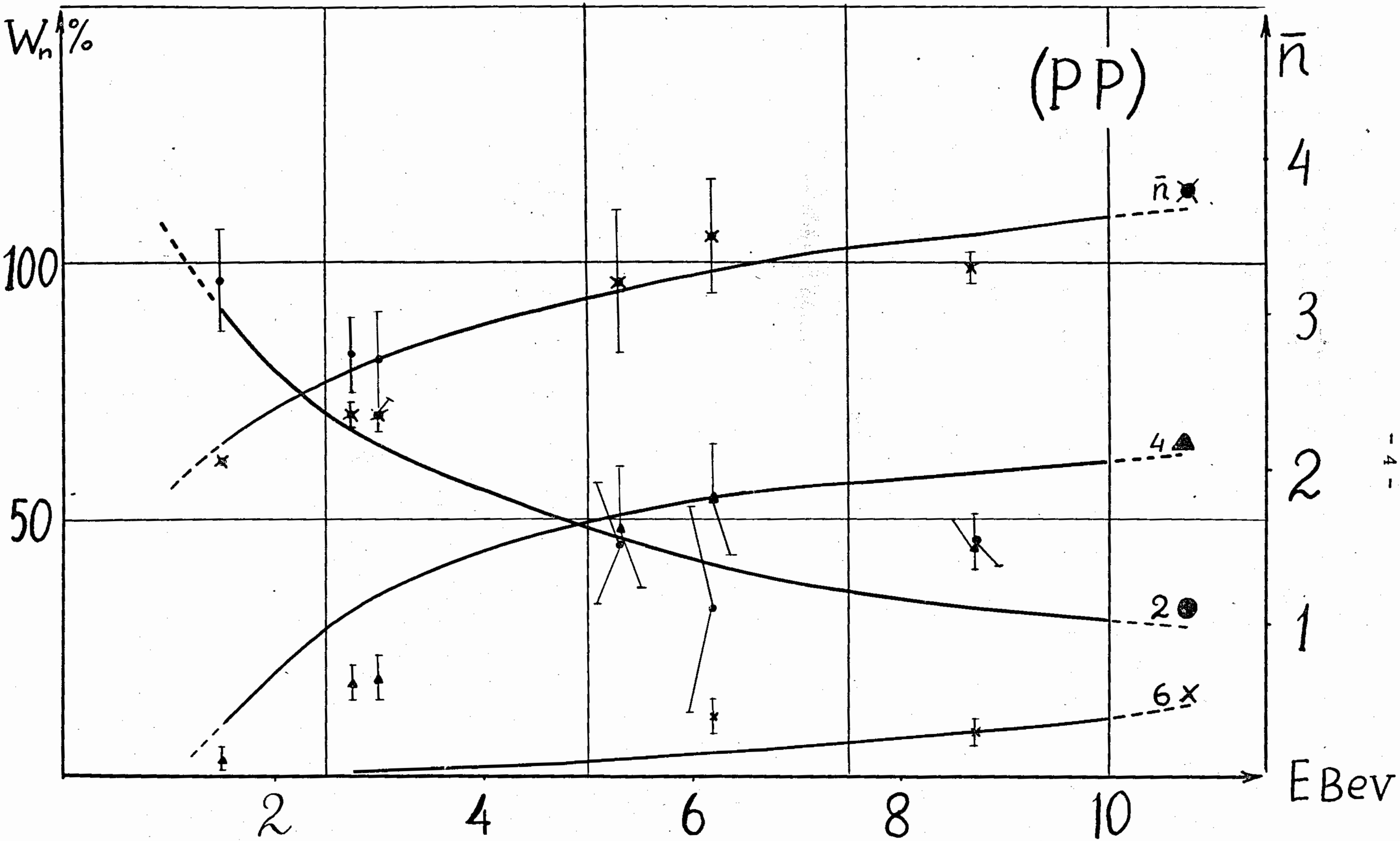

Fig. 1

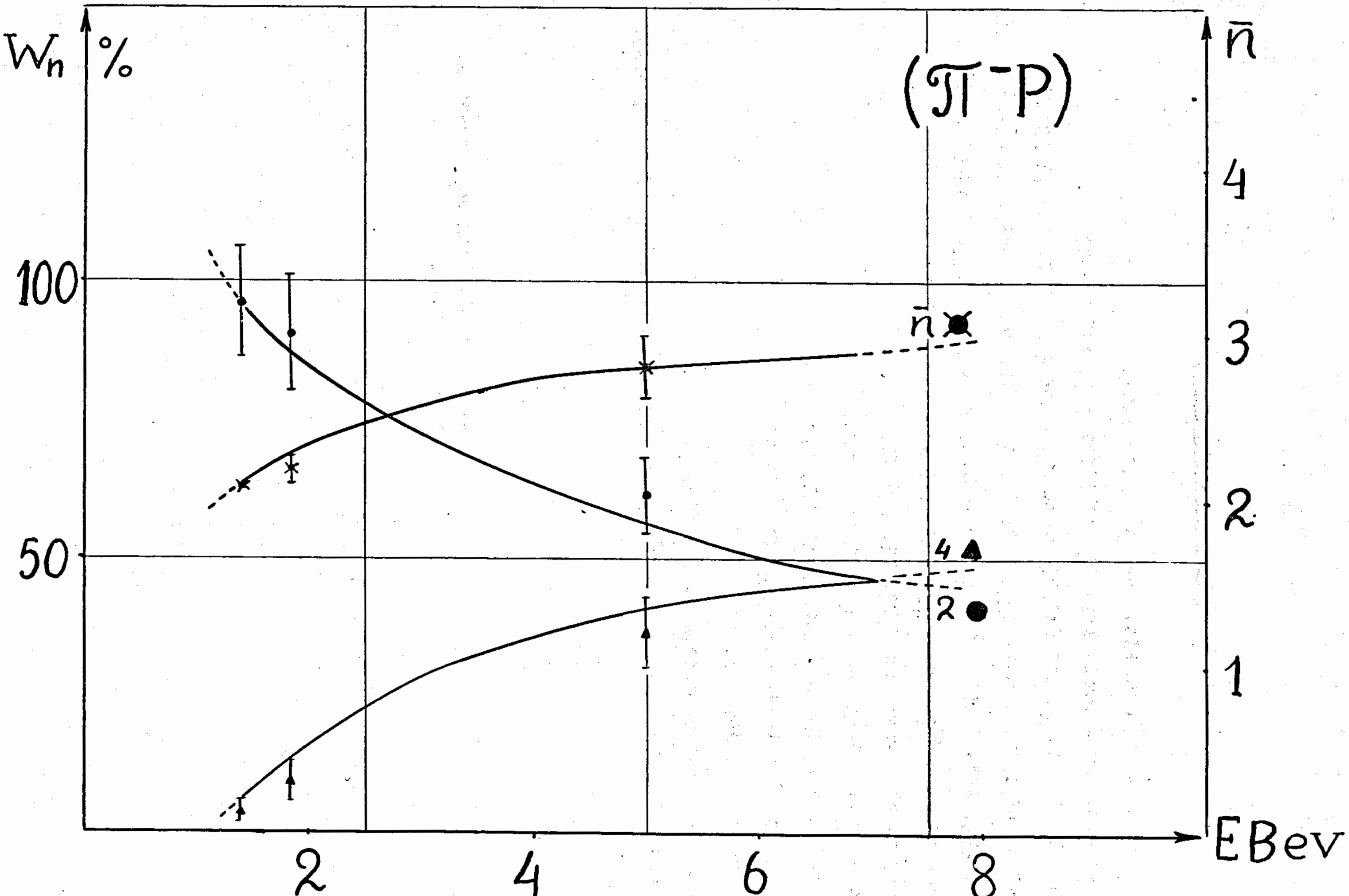

Fig.2

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