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The value $\sigma \simeq 40$mb has been obtained for the total effective cross section of (NN)-interaction at E = 9 Bev.[1] However, it is possible to get a more exact value σ if an experimental one of the mean proton range in photoemulsion is used.

First consider the mean proton range in the photoemulsion Ilford G-5 at E = 5.7Bev[2]. The theoretical value of this range calculated in accordance with the optical model is in good agreement with the mean experimental value L = 37.6 cm, if the nucleon distribution density in nuclei is taken from the experiments on quick electron scattering on nuclei[3]. Here for the interaction cross section of an incident nucleon with a nucleon in a nucleus the value $\bar{\sigma} \simeq 32$ mb is chosen which also agrees well with the experimental one at E = 6.15 Bev[4].

Detailed calculations made for other cases[5] on the basis of the optical model have also shown that it is possible to get a good agreement with experiment if the nucleon density distribution in luclei is taken from the experiments on quick electron scattering on these nuclei. In these cases $\bar{\sigma}$ is equal to σ with an accuracy of some percent, where σ is the interaction cross section of free nucleons[6].

The authors[7] arrived to the same conclusions.

It is natural to suppose that these conclusions are also correct at E = 9 Bev. In Fig. 1 are plotted the calculated values of the mean free range $L = L(\sigma)$ of the 9 Bev proton in NIKFI -P photoemulsion for $\sigma = \bar{\sigma}$ *).

As calculations have shown this curve differs from an analogous one $L = L(\bar{\sigma})$ calculated for σ = 30 mb by only some percent.

The theoretical value of the range equals the experimental one

$$L = (37.1 \pm 1{,}0)\text{cm}^{|1|}, \quad \text{if } \bar{\sigma} = \sigma = (30 {}^{+5}_{-3}) \text{ mb}.$$

From Fig. 1 follows the value of proton-nucleon cross section $\bar{\sigma} \simeq \sigma = (33 {}^{+5}_{-3})$mb for a more rough experimental value $L = (34.7 \pm 1.5)$ cm[8]. The obtained values σ are close to the total cross section of proton-proton interaction at E = 6.15 Bev[4].

The calculated cross sections σ_{in} for the elements C,N,O,Br,Ag at $E \simeq 9$ Bev are equal to, respectively: 240, 260, 290, 900, 1070 (in millibarns) (on the cross sections σ_{in} and σ_{el} for hydrogen see[1],[6],[9]).

Thus, the obtained results as well as those of[9] show that the optical model may be successfully applied to the description of the interaction of elementary particles in the energy range $E > 1$ Bev.

Note that at the energy $E \gtrsim 1$ Bev the nucleon interaction cross sections with nuclei

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*) We started from the following composition of the photoemulsion (the number of atoms N . 10^{-22}in cm^3). N_H = 3,47; 2,93 N_C = 1,36; 1,39; N_N = 0,29; 0,37; N_O = 1,02; 1,06; N_{Br} = 1,02; 1,02; N_{Ag} = 1,02; 1,02; for Ilford G-5 and NIKFI-P respectively.

appear to be sensitive to the form of nuclear boundary diffusion. In this case the main contribution is made by the interactions with the collision parameter which is of the order of the nuclear radius. This opens new possibilities for experimental study of a diffusion nucleus.

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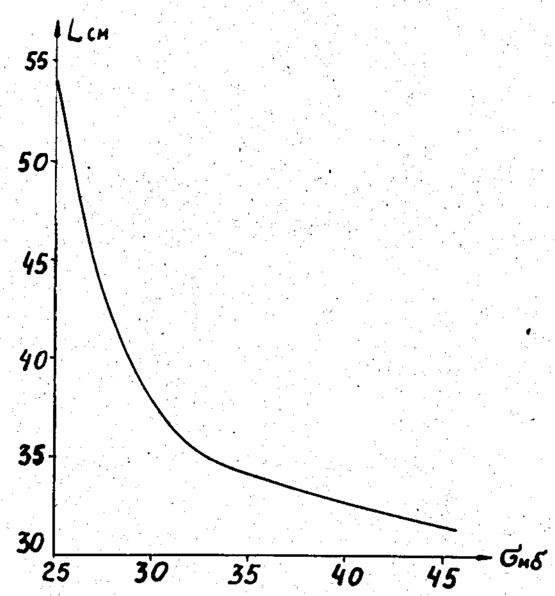
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