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In the recent time some papers on hadron-nuclear interactions have discussed the problems of possible change of the value of the hadron-nucleon cross section in successive interactions in nuclei [1-4]. It follows from ref. [3], where the spectra of leading particles in proton interactions with various nuclei have been analysed that the interaction cross section of "nonasymptotic" hadrons with nucleons is about 1/6 of the normal cross section. The analysis of the correlations of the multiplicities of fast and slow particles (ref. [4]) as well as the neutral pion spectra in high energy hadron interactions with nuclei makes it possible to estimate that $\sigma_2^{in} < \frac{1}{4}\cdot\sigma_1^{in}$ (σ_1^{in} and σ_2^{in} are the cross sections of inelastic interactions of the normal and "nonasymptotic" hadron with the nucleon, respectively).

The present study shows that independent data on σ_2^{in} can be obtained also from the analysis of the dependence of the average inelasticity coefficient upon the atomic number of the target-nucleus. Consider hadron interactions with the nucleus, if $E_0 \gg m$, $\lambda \ll R$ (E_0, m, λ is energy, mass and Debroigl wavelength of the hadron, respectively; R is the nuclear radius). The inelastic interaction of the hadron with the nucleus will be considered in the terms of energy loss by the primary hadron when it passes through the nucleus. A similar approach has been applied in ref. [5] to study the interaction of a cluster with the nucleus. For the sake of conveniency let us distribute in the formal way uneven energy losses of the primary hadron continuously along the path of its motion through the nucleus, i.e., let us "spread" these losses along the direction of motion. Under these assumptions the mean energy dE lost by the particle passing through the nuclear matter in the $x, x+dx$ layer can be written as

$$dx = - Ek\rho\sigma^{in}dx, \qquad (1)$$

where E is the average energy of the hadron after its passing the x distance of the nucleus, k is the average coefficient of inelasticity of hadron-nucleon interaction, ρ is the nucleon density in the nucleus, σ^{in} is the cross section of hadron inelastic interaction with a nucleon.

Equation (1) can be obtained if one takes into account the following relations:

$$\frac{dE}{dx} \sim \frac{\Delta E}{\ell} \qquad \text{and} \qquad \Delta E = -kE,$$

where $\ell = \frac{1}{\sigma^{in}\rho}$ is the mean free path of the hadron in the nucleus between two inelastic collisions, ΔE is the average energy loss along the free path.

Taking for the nucleus a model of homogeneous sphere (ρ = const.) having the R radius, write the solution of equation (1) with the boundary conditions $E(x, b)\big|_{x=-\sqrt{R^2-b^2}} = E_0$, where E_0 is the initial energy of the primary hadron, b is the impact parameter (see *Fig. 1*) as follows:

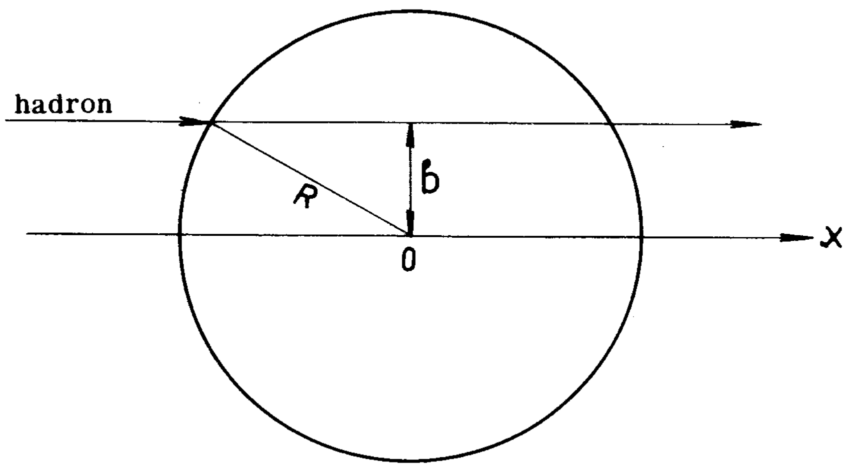

Fig. 1. Passage of the hadron through the nucleus. R *- is the nuclear radius,* b *is the impact parameter.*

$$E(x, b) = E_0 \exp\left(-\int_{-\sqrt{R^2-b^2}}^{x} \rho k\sigma^{in}(x')dx'\right). \qquad (2)$$

Taking that within $-\sqrt{R^2-b^2} \leq x \leq (\sigma_1^{in}\rho)^{-1}$ the cross section of hadron-nucleon interactions is σ_1^{in}, while within $(\sigma_1^{in}\rho)^{-1} \leq x \leq \sqrt{R^2-b^2}$ it has the "nonasymptotic" value of $(\sigma_2^{in}$, and using the expression of the inelasticity coefficient for hadron-nuclear interaction with the given impact parameter $K(b) = [E_0 - E(\sqrt{R^2-b^2}, b)]E_0^{-1}$ after integration in (2) we obtain

$$K(b) = 1 - \exp\left[-k\frac{\sigma_1^{in}-\sigma_2^{in}}{\sigma_1^{in}} - 2\sigma_2^{in}k\rho\sqrt{R^2-b^2}\right]. \qquad (3)$$

When deducing expression (3) we used the approximation in which k, σ_1^{in} and σ_2^{in} do not depend upon x, which follows (at least, for k and σ_1^{in}) from the experimental data showing that with sufficiently high energies (tens *GeV* and higher) the energy dependence of these values is rather small.

By averaging $K(b)$ over impact parameter by means of the relation $K = (\pi R^2)^{-1}\int_0^R K(b)2\pi b\,db$ we obtain for the case of sufficiently heavy nuclei the following formula:

$$K = 1 - \exp\left(-k\frac{\sigma_1^{in} - \sigma_2^{in}}{\sigma_1^{in}}\right) \times$$
$$\times[1 - (2\sigma_2^{in}k\rho R + 1)\exp(-2\sigma_2^{in}k\rho R)]2^{-1}(\sigma_2^{in}k\rho R)^{-2}. \qquad (4)$$

From formula (4) it follows that by analysing the experimental data on the A-dependence of hadron-nucleon coefficient by taking into account the relation $R = r_0A^{1/3}$ (where $r_0 = 1.2\text{x}10^{-13}$ *cm*) one can obtain information on σ_2^{in}. *Fig. 2* shows the experimental data on nucleon-nuclear coefficients of inelasticity [6-9] and a set of curves following from formula (4) for various relations between σ_2^{in} and σ_1^{in} with $k = 0.5$ and $\sigma_1^{in} = 32$ *mb*. If one restricts oneself to the consideration of the atomic numbers $A > 50$ and uses the experimental data of refs. [6-8] * one can evaluate the following nonasymptotic cross sections: $0.1\sigma_1^{in} > \sigma_2^{in} < 0.5\sigma_1^{in}$ (see *Fig. 2*). At the same time the data obtained in ref. [9] results in another estimate: $\sigma_2^{in} \simeq \sigma_1^{in}$ (the upper curve in *Fig. 2*).

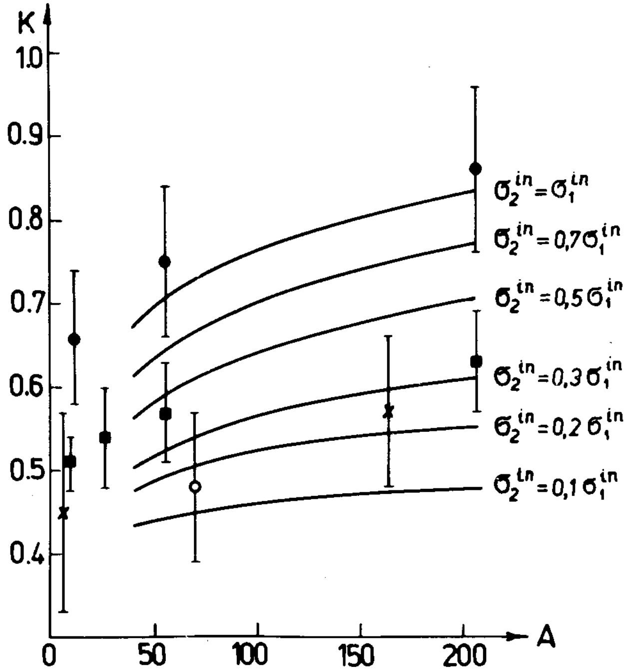

Fig. 2. A-dependence of the nucleon-nuclear average inelasticity coefficient. The experimental data of the following refs.: ref. [6] – ✱, ref. [7] – ϕ, ref. [8] – ■, ref. [9] – ●. Solid curves have been obtained according to formula (4) with $k = 0.5$, $\sigma_1^{in} = 32$ *mb*, $R = 1.2 \times 10^{-13} A^{1/3}$ *cm.*

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* Ref. [6] gives the partial coefficient of inelasticity K_{π^0}. The value of the full inelasticity coefficient presented in *Fig. 2* have been obtained from the $K \simeq 3K_{\pi^0}$ relation.

In order to obtain unique information on σ_2^{in} from the data on the hadron-nuclear coefficient of inelasticity it is necessary to eliminate the contradiction in experimental data by performing precise experiments at various energies and with various nuclei by using the accelerators.

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