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STUDY OF FEATURES FOR PARTICLE PRODUCTION IN NUCLEUS-NUCLEUS INTERACTIONS

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The study of nucleus-nucleus interactions is one of sources of information about quark degrees of freedom in nucleus, which are displayed through features of secondary particle production in such interactions, in comparison with those of nucleon-nucleon interactions.

To obtain such an information about particle production and, hence, about new laws of nuclear interactions one needs to develop new approaches for analyse experimental results. For this purpose the searches of new kinematical variables or correlation dependences the most sensitive to exhibition of expected effects are carried out. The important information may be received also by studing correlation dependences between various kinematical parameters of particles.

Some results for similar analysis for π^--meson production in interactions of protons, deutrons, He and C nuclei at incident momenta 4.2 GeV/c per nucleon and deutrons at momentum 1.7 GeV/c per nucleon with carbon nuclei in JINR's two meter propan bubble chamber were presented in [1,2].

The distributions of average momentum for π^--mesons in dependence on their cumulative number $n_k = \frac{E-p_{\parallel}}{m_N}$ for various incident momenta of deutrons are shown on Fig.1. It is visible, that the presented dependences have the identical characteristic features as minimum at cumulative number 0.1–0.4. In [3] the similar behaviour of this correlation dependence was associated with indication of quark degrees of freedom in nuclei. However study of dependence between Feynman variable for π^--mesons $x_F = p^*_{\parallel}/p^*_{max}$ and their cumulative number, presented in [1] has shown, that it is due to only change for region of π^--meson production. Moreover this correlation does not vary at change of incident nucleus masses, and depends only on its energy.

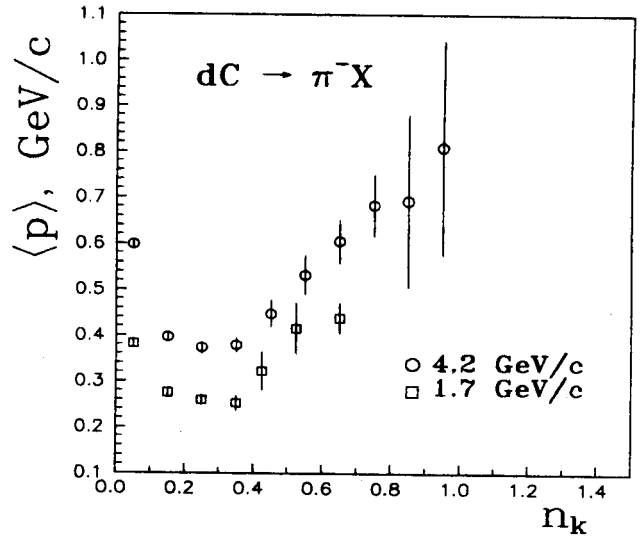

Fig.1. The average momentum $< p >$ as a function of cumulative number n_k for π^--mesons at incident deutron momenta 1.7 and 4.2 GeV/c per nucleon

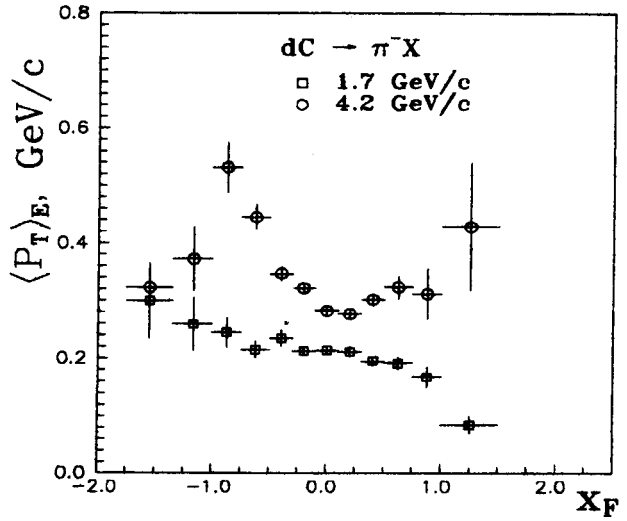

Fig.2. The energy weighted average transverse momentum $< p_T >_E$ for π^--mesons as a function of Feynman x_F at different momenta of incident deutrons

The dependence of the weighted average transverse momentum on Feynman variable for π^--mesons, shown on Fig.2, varies more distinctly at change of incident deutrons momentum [2]. As far as the nuclear interactions are similar at considered energies of collisions with nucleon-nucleon ones [4], this change in behavior of correlations permits us to assume the change of meson production mechanism at these energies in nucleon-nucleon interactions.

The features in correlation between kinematical parameters of particles considered in [1,2] need the further study and offerred approach proves to be helpful in research of nucleus-nucleus interactions.

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METHOD OF THE LIGHT FRAGMENT IDENTIFICATION IN CENTRAL COLLISIONS OF 160 A GeV LEAD PROJECTILE WITH NUCLEI OF PHOTOEMULSION

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Previously [1,2] we studied the ^{6}Li fragmentation with 4.1 GeV/c per nucleon momentum. Here we discuss the possibility of investigation of lead nuclei fragmentation with energy 160 A GeV in central interactions with nuclei in photoemulsion. We suggest to use the new method of fragment angle measurement with respect to the fiducial track, which is one of the fragment's track in the same event. To provide the high reliability of the fragment charge estimation it was suggested to use the blob length sum.

The inclusive transverse momenta distribution of fragments with mass number A_F obey the Rayleigh distribution with constant σ_F^2 , which follows, in generally, the parabolic dependence [3]

$$\sigma_F^2 = \sigma_0^2 \cdot \frac{A_F \cdot (A - A_F)}{A - 1} , \qquad (2)$$

where $\sigma_0^2 = P_F^2/5$ is determined by a Fermi momentum of initial projectile nucleus with mass number A. Constant σ_0^2 is the dispersion of the normal distribution $N(0.0, \sigma_0^2)$ for the projectile nucleon momentum projection in the projectile c.m.s. on the arbitrary axis. It is possible to determine the constant of the fragment transverse momenta distribution from the distribution of the fragment transverse momentum projection $P_{\perp\varphi} = 2 \cdot Z \cdot P_0 \cdot \mathrm{tg}\varphi$ on the emulsion plane.

From the kinematics of Pb+Ag collisions at 160 A GeV it follows that the expected mean value of the angle φ between the projection on the emulsion plane of the momentum vector of α−particle, which is the fragment of ^{208}Pb, and the projection on this plane the momentum vector of initial nucleus