PRODUCTION OF CUMULATIVE PROTONS IN HADRON AND NUCLEUS-NUCLEUS COLLISIONS AT HIGH ENERGIES

Bazarov E.H., Yuldashev B.S., Lutpullaev S.L., Olimov K., Petrov V.I.
Physical Technical Institute SPA " Physics-Sun " Uzbek Academy of Sciences, Tashkent, Uzbekistan
E-mail: olimov@uzsci.net

The processes of production cumulative protons in ^{16}O p-collisions at 3.25 GeV/c in π^-C collisions at 40 GeV/c, pC interactions at 4.2 and 9.9 GeV/c, ^{4}HeC and CC collisions 4.2 *A* GeV/c and in pNe interactions at 300 GeV/c.

Inclusive cross sections of cumulative protons and their invariant structure functions on the cumulative number ($\beta = (E\text{-}P\cos\theta)/m_N$, where E, F and θ – are the energy, momentum and angle of proton emission, m_N – nucleon mass) in the $\beta > 1.2$ satisfactorily described by an exponential function of β. The values of the slope parameter for all of the events are on average 8.1 ± 0.1. They were independent of the type of projectile, target nucleus and primary energy.

The fraction of events with the formation of cumulative protons for the same target nucleus was found to depend on the type of incident particle (pion or proton), but independent of the baryon mass of the projectile (^{4}He or C).

The average multiplicity of cumulative protons for the same target nucleus was independent of the type of incident particles (pions, protons, ^{4}He or C). Dependence of the average multiplicity of cumulative protons from the mass number of the target nucleus A satisfactorily described by a power function $\langle n_{cum} \rangle = b\, A^{\alpha}$ with parameter values $b = 0.724 \pm 0.035$ and $\alpha = 0.154 \pm 0.015$. The exponent is close to the value of $\alpha = 1/6$. Hence, setting the average number of intranuclear rescattering $\langle \upsilon \rangle \sim A^{1/3}$, we obtain the dispersion $D(\upsilon) \sim A^{1/6}$, i.e. equal to the number fluctuations of the nuclear density.

Thus, the formation of cumulative protons occurs on the script of "cold" model, characterized by fluctuations in the density of nucleons in the nucleus in its ground state, and the interaction of the incident hadron with this dense cluster (fluctuons). An additional argument in favor of the production of cumulative protons occurs at the above scenario, is the independence of the share of cumulative events for the target of the carbon nucleus of the mass number of the primary nucleus. This result is proof that it is carried out "cold" scenario of cumulative protons.