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UNCERTAINTY RATIO FOR SHORT RANGE CORRELATION SRC

L. Abesalashvili* and L. Akhobadze*

*High Energy Physics Institute, Ivane Javakhishvili Tbilisi State University, Tbilisi, Georgia

Characteristics of hard and soft interactions and distributions of cumulative protons for A_i A_t nucleus-nucleus collisions (p,d,He,C)(C,Ta) at (4.2,10)AGeV/c in rapidity space are analyzed. The number of the π^- - mesons and protons with maximal cumulative number Nn_c^{max} do not depend on the atomic number A_i of the projectile, on the atomic number A_f of the target and on the incident energy, but depend only on n_c^{max}. Short range correlation SRC condition $\Delta Y=|Y_i-Y_j|<2$ are checked. Uncertainty ratio in Y- space of rapidity $\Delta Y\Delta P\geq\hbar$ between ΔY and ΔP is entered. The adron's interactions time and radius $r_{in}\approx(10^{-14})$ cm are estimated.

Key words: Cumulative end surrouding protons, rapidity space, hard and soft processes, short range correlation

In this regard, we have studied the dependence of the mean set of <*n*> - secondary particles on the number of *p* - protons, *n* - neutrons and *N* - nucleons involved in the interaction. The number of *Rp*-protons, *Rn*-neutrons and N_A -nucleons (interacting - protons, neutrons and nucleons) is determined in a model — collision within a model that interacts independently. The images *Rp*, *Rn* and N_A are obtained with the assumption that the nucleons have a strictly defined radius [1]. The number of protons involved in the interaction is thus determined

$$R_p=(Z_iA_t^{2/3}+Z_tA_i^{2/3})/(A_i^{1/3}+A_t^{1/3})^2 \tag{1}$$

Rn - The number of neutrons involved in the interaction is thus determined

$$R_n = (N_iA_t^{2/3}+ N_tA_i^{2/3})/ (A_i^{1/3}+ A_t^{1/3})^2 \tag{2}$$

N_A - The total number of nucleons is so

$$N_A = (A_iA_t^{2/3}+ A_tA_i^{2/3})/(A_i^{1/3}+ A_t^{1/3})^2 \tag{3}$$

Ai is the mass number of the transmitting nucleus, At is the mass number of the target nucleus.

It is known that Heizenberg's Uncertainty Ratio for momentum and coordinate is thus written

$$\Delta P\Delta x\geq\hbar. \tag{4}$$

Uncertainty Ratio for energy and time is as follows:

$$\Delta E\Delta t\geq\hbar. \tag{5}$$

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From (2) it can be seen that the greater energy releases, the faster the proceeds, i. e. the value of Δt is small. The larger the transmitted momentum from (1), the closer the colliding particles move to each other. The time Δt of interaction determines the radius:

$$r_{in} = \Delta t \cdot c\,, \tag{6}$$

where c is the speed of light.

If transmitted energy is 4 GeV, then

$$\Delta t[\sec] = \frac{\hbar}{\Lambda E} = \frac{1.05\times(10^{-27})erg\cdot\sec}{4\cdot 1.6\cdot 10^{-3}erg} = 0.16\cdot 10^{-24}\sec = 1.6\cdot 10^{-25}\sec\,. \tag{7}$$

It follows that the radius of interaction is:

$$r_{in}=\Delta t\cdot c=1.6\cdot 10^{-25}\cdot 3\cdot 10^{10}\ cm=4.810^{-15}\ cm. \tag{8}$$

We can write (1) the image in the same way

$$\Delta Y\Delta P\geq\hbar\ . \tag{9}$$

ΔY is the distance between the particles in the space of rapidity. If the distance of rapidity space ΔY is small, then the value of the transmitted momentum is large. If the value of ΔY is large, then the value of ΔP is small and the particles momentum is large. According to this logic the cumulative P^{cum} , their surrouding protons P^{ass} momentum and $<\Delta Y>$ must be sharply different from each other. The experiment also proves this [2,3]. Experimental data indicate that the density of nuclear matter in the central collisions of light nuclei (carbon-carbon $4.2AGeV / c$) is close to the transition to qg-quark-gluon plasma, i. e. in laboratory conditions we can obtain high-density nuclear matter.

Experimental data are obtained on the two metre propane bubble chamber *PBC-500* in the Laboratory of High Energy of the Joint Institute for Nuclear Research (Dubna). The chamber was bombarded by beams of relativistic nuclei *p, d, He, C* in the momentum range $(2\text{-}10)AGeV/c$ (*Fig.* (1-3)).

$<\Delta Y(P^{cum})>(CTa;4.2AGeV/c)=(0.242\pm0.006);$

$<\Delta Y(P^{ass})>(CTa;4.2A\mathrm{GeV}/c)=(0.460\pm0.012);$

$$<P_L(P^{cum})>(CTa)(4.2AGeV/c)=(0.578\pm0.015)\mathrm{GeV/c};$$
$$<P_L(P^{ass})>(CTa)(4.2AGeV/c)=(1.098\pm0.012)\mathrm{GeV/c}. \tag{10}$$

$<\Delta Y(P^{cum})>(pC;4.2AGeV/c)=(0.082\pm0.033);$

$<\Delta Y(P^{ass})>(pC;4.2AGeV/c)=(0.511\pm0.022);$

$$<P_L(P^{cum})>(pC)(4.2AGeV/c)=(0.591\pm0.031)GeV/c;$$
$$<P_L(P^{ass})>(pC)(4.2AGeV/c)=(1.283\pm0.048)GeV/c. \tag{11}$$

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Conclusion

To study of average kinematic characteristics of protons, deuttrons, helium's and carbons nucleus at carbons nucleus A_iA_t=$(p,d,He,C)C$ generated as a result of collisions surprised us [4-7]:

1. The short range correlation *SRC* condition $\Delta Y = |Yi - Yj| < 2$ strictly completed for cumulative protons P^{cum}. The value of ΔY are in the range (0-1).
2. Average kinematic characteristics of cumulative protons $<\Delta Y(P^{cum})>$ and $<P_L(P^{ass})>$ do not depend on the *Ai* and *At* (on the atomic number of projectile and the incident energy). It can by said then the hypothesis of soft decoloration takes place.
3. The value $<\Delta Y(P^{ass})>$ and $<\Delta Y(P^{s})>$ in the range (0-2) and 98% meet *SRC* the condition$<\Delta Y><2$.
4. Average value of $<\Delta Y>$ for protons P^{ass} and P^{s} strongly dependent on the target mass – $(<\Delta Y(P^{ass})>Ta<<\Delta Y(P^{ass})>C)$.
5. Uncertainty ratio in the rapidity space between ΔY and ΔP it can be written like this $\Delta Y \Delta P \geq \hbar$, i. e. decreasing the value of ΔY lads to increasing the value of the transmitted impuls ΔP.
6. The time and radius of interaction of the adron's are estimated to be equal $r_{in} \approx (10^{-14})$ *cm.*

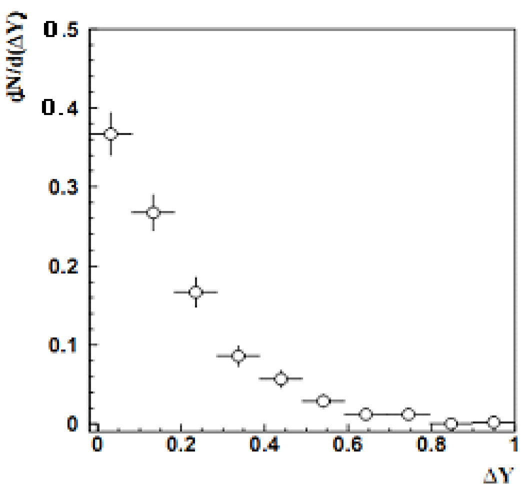

Fig.. 1. $d(\Delta Y)=f(\Delta Y)$. ΔY - distribution for cumulative protons P^{cum} - $(10 GeV/c) \rightarrow P^{cum}$.

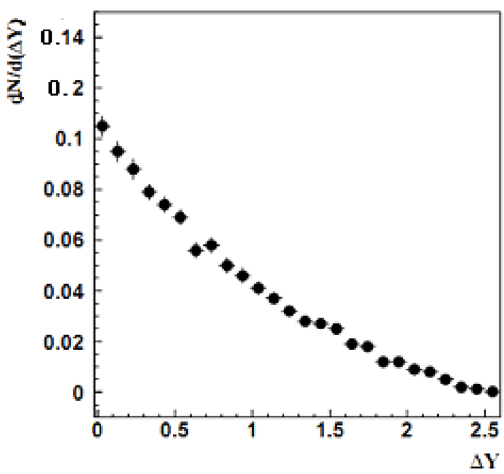

Fig.. 2. $dN/d(\Delta Y)=f(\Delta Y)$. ΔY - distribution for surouding protons from hard processes N_{ev}^{H} - $pC(10 GeV/c) \rightarrow P^{ass}$.

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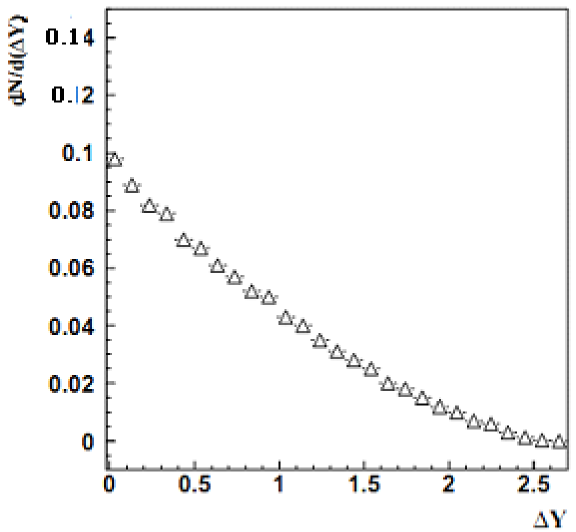

Fig. 3. $dN/d(\Delta Y)=f(\Delta Y)$. ΔY – distribution for protons P^S from soft processes $N_{ev}{}^S$ - $pC(10GeV/c)\rightarrow P^S$.

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