Nature of multiplicity correlations in ^{12}C-nucleus reaction at 4.5 AGeV

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Multiplicity correlations in high energy hadron-nucleus and nucleus-nucleus interactions are considered one of the most important parameter to study the dynamics of particles production. Several workers[1-3]have been reported that the multiplicity correlations amongst the secondary charged particles produced in these reactions are linear, except the multiplicity correlations between <Ns>-Nb,<Ns>-Nh and <Ns>-Ng. these correlations acquire almost constant values beyond Nb~9,Nh~31 and Nh~12.here,Nb denotes the number of black track having relative velocity, $\beta<0.3$.the tracks formed by particles with $0.3\leq\beta\leq0.7$ are referred to as grey particles (Ng).the grey and black tracks taken together are treated as heavily ionizing tracks and the number of these tracks with $\beta\leq0.7$ is given by Nh(=Nb+Ng).the tracks formed by particles with $\beta>0.7$ are considered as relativistic charged particles and the number of these particles in an event is represented by Ns.

In the present work ,an attempt has been made to understand the nature of the multiplicity correlations between <Ns>-Nb,<Ns>-Nh and <Ns>-Ng.for this purpose the regression of the type <Ni(Nj)>,where Ni Nj=Nb,Ng,Nh or Ns and $i \neq j$ for ^{12}C-nucleus reactions at 4.5 A GeV and their dependence on the nature of the projectile are investigated.

The dependence of <Ns> on Nh and <Nb> on Ng are exhibited in the figures. The regression <Ns (Nh)>, <Ns (Nb)> and <Nb (Ns)> may be represented by the following second order polynomial quite well.

$$\langle N_s\rangle=(2.42496\pm1.56271)+(0.59283\pm0.16209)N_h +(-0.00654\pm0.00355)N_h^2 \quad (1)$$

$$\langle N_s\rangle=(3.66366\pm1.51856)+(1.38208\pm0.30583)N_b +(-0.03987\pm0.01284)N_b^2 \quad (2)$$

$$\langle N_s\rangle=(2.84877\pm1.02635)+(0.96151\pm0.16071)N_g +(-0.02319\pm0.00532)N_g^2 \quad (3)$$

The continues curves shown in figure correspond to eq (1-3).it may be seen in the figure that the experimental data obtain in 4.5 A GeV ^{12}C-Nucleus interactions may be represented by the second order polynomial. On comparing the finding of the present work with those obtained in high energy hadron-nucleus and nucleus-nucleus collisions [5, 6], it may be concluded that the nature of the correlations in both type of reactions is perhaps the same.

References

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