SOME RESULTS ON CENTRAL 12C-AgBr COLLISIONS AT 4.5 A GEV

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Introduction

The study of peripheral collisions of relativistic heavy ions has been gaining more and more interest in recent years.However,relatively little attention has been focused on the study of central collisions of relativistic nuclei in which almost the whole projectile takes part in the interactions[1-6].This might be due to the fact that the probability of total disintegration of Ag and Br nuclei of nuclear emulsion is quite small, leading to low statistics of the experimental data.Nevertheless,the study of central collisions is extremely important because during such collisions, the nuclear matter might be compressed to several times its normal density and consequently several interesting phenomena are expected to occur. The study of central collisions of relativistic nuclei can throw some light on the possibility of investigating the effects of multi-nucleon interactions, collective properties of nuclear matter, production of shock waves in nuclear matter and its possible transitions to the quark-gluoan phase.Furthermore,some characteristics of the central collisions are more critical to the choice of the collision model.Thus,experimental data on central collisions may also be used to refine the existing models put forward for explaining the dynamics of multiparticle production in heavy ion interactions.

Experimental Results and Conclusion

It has been reported that the events having at least 28 heavily ionizing tracks i.e. Nh ≥ 28 may be classified as events of the total disintegrations of Ag and Br nuclei[1-5].The reason for including disintegrations with Nh ≥ 28 in various analyses might be due to the fact that these events correspond to a total charge close to the average charge of Ag and Br [Z=41] and hence they cause a very high degree of breakup of the target nucleus.Thus,for studying various characteristics of secondary particles produced in central 12C-nucleus collisions at 4.5A GeV,we have carried out a search for the events with Nh ≥ 28.An important characteristic of the catastrophic destruction of heavy emulsion nuclei induced by very fast projectile, is the probability(Ap)which is the ratio of the number of events having Nh ≥ 28 and the total number of disintegrations involving Ag and Br nuclei. The probabilities of total breakup of AgBr nuclei in heavy ion interactions at 4.5 A GeV along with other projectiles at the same energy are listed in the table. It may be seen in the table that the probability of catastrophic destruction of heavy emulsion nuclei increases with the increasing mass of projectile.

Table

Projectile	**Probability (%)**	**References**
Deuteron	2.6±0.5	7
α-particle	6.8±0.9	7
Carbon	11.85±1.32	Present Work
Carbon	11.68±0.09	8

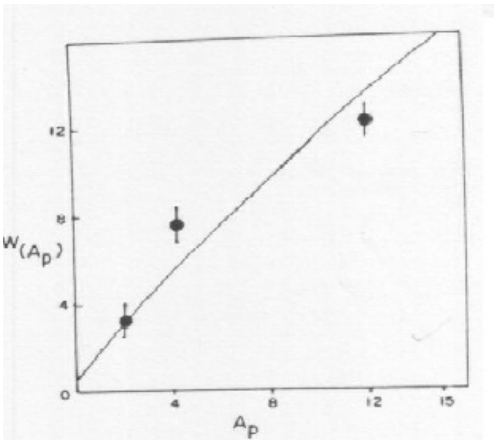
The probability of W(Ap) of total disintegration of Ag and Br nuclei caused by different projectiles at 4.5 A GeV is Plotted in fig.1.It may be of interest to point out that the solid line

shown in fig.1 can be represented by the following relation:

$$W(Ap) = \alpha A^{\beta}$$

The best fitting value of parameters α and β are (1.82±0.18) and (0.80±0.24) respectively. Values of these parameters obtained by Tauseef Ahmad et al[9] are 1.99±0.27 and 0.82±0.05 respectively.

Fig.1:

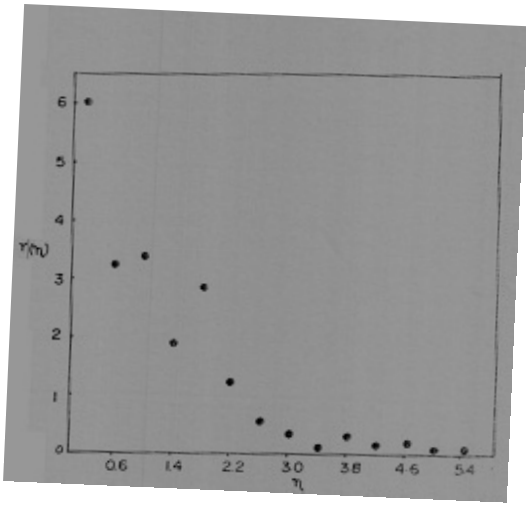


To investigate the characteristics of charged shower particles, we have examine the behavior of the normalized pseudo rapidity density,$_{\gamma}$**(η),** defined as:

$$R(\nu) = \frac{\rho(\eta)}{\rho_{N_{h=0,1}}(\eta)}$$

Where ρ(η) = (1/N)(dNs/dη) denotes the shower particles density determined for totally disintegrated events. The term ρ_x (η) represents the pseudo rapidity density for the Nh =0.1 events having Nh ≤ 1 in case of nucleus-nucleus collisions at the same energy. The normalized pseudo rapidity density is exhibited in fig.2. It may be noticed in this figure that $_{\gamma}$**(η)** is less than unity in the projectile fragmentation region **(η >4.62)** for totally disintegrated events in 4.5 Gev ^{12}C-nucleus interactions. This result suggests that the additional particles created in consecutive intra-nuclear collisions carry away some of the energy of the projectile nucleus thereby reducing its momentum in case of catastrophic destruction of heavy emulsion nuclei. It may also be seen in the figure that the mean normalized pseudo rapidity density increases rapidly in the target fragmentation zone hypothesis, which envisages that some more time is neded for the creation of particles in its own rest frame of reference.

Fig.2:



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